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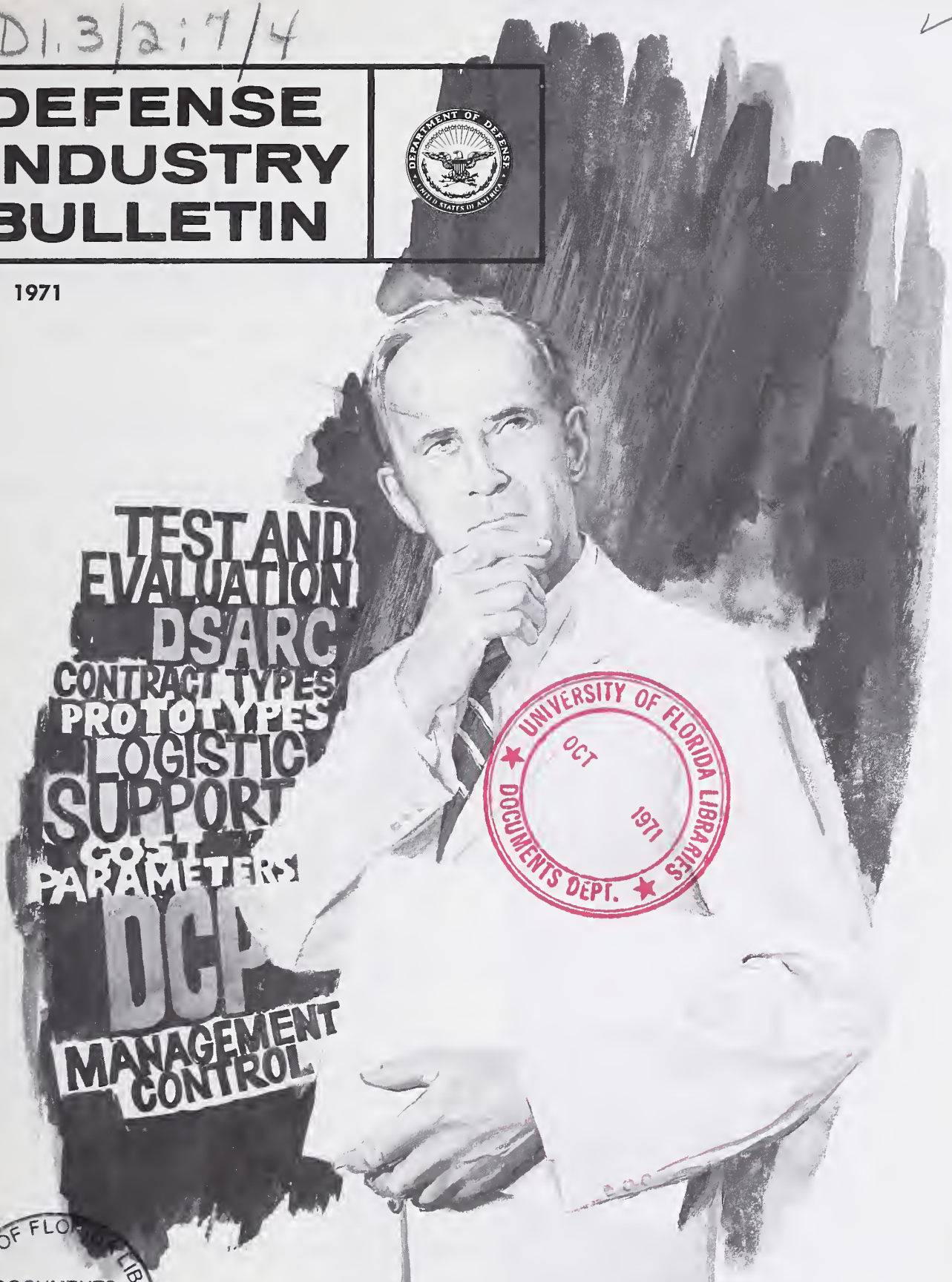

DOD Directive 5000.1
A Challenge for Program Managers

DEFENSE INDUSTRY BULLETIN

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The *Bulletin* serves as a means of communication from the Department of Defense and its components to actual or potential defense contractors, labor and other interests. It provides information and guidance on official policies, programs, procedures, activities and developments concerning the management of research, development and acquisition of equipment, supplies and services needed in the national defense effort. It seeks to stimulate thought by the defense-industry team in solving problems allied to the defense effort.

The *Bulletin* is distributed free of charge to qualified representatives of DOD components, industry, labor and other persons engaged in the defense-industry relationship. Subscription requests should be submitted on organizatian letterhead, and must indicate the organization's and requestor's participation in the defense-industry relationship. Send requests to: Editor, Defense Industry Bulletin, Defense Supply Agency, Cameron Station, Alexandria, VA 22314.

Suggestions concerning possible subjects for future issues are welcome and should be sent to the Editor.

IN THIS ISSUE

Major Defense System Acquisition Policy Announced

This article highlights the salient points contained in DOD Directive 5000.1, "Acquisition of Major Defense Systems," July 13, 1971. Readers may obtain a copy of this directive without charge, one copy per request, from the Naval Publications and Forms Center, Code 300, 5801 Tabor Ave., Philadelphia, Pa. 19120

The following articles are based on briefings given by the respective Defense Department officials at a recent joint DOD/ National Security Industrial Association symposium on major defense system acquisition policy.

Policy Highlights

On July 13, 1971, the Defense Department issued DOD Directive 5000.1, titled "Acquisition of Major Defense Systems." The directive promulgates policy for major defense system acquisition by the military departments and defense agencies (hereafter referred to as DOD components).

Designation of major programs will be made by the Secretary of Defense or the Deputy Secretary of Defense, who shall consider:

- Dollar value (programs requiring research, development, test and evaluation estimated to cost over $50 million, and production estimated to cost over $200 million).
- National urgency.
- Recommendations of heads of DOD components or officials of the Office of the Secretary of Defense.

In addition, management principles contained in DOD Directive 5000.1 will apply to *all* DOD acquisition programs.

Mode of Operation

Responsibility and authority for the acquisition of major defense systems shall be decentralized to the maximum practical extent consistent with the urgency and importance of each program. Development and production of a major defense system shall be managed by a single individual (program manager). He shall have a charter which provides sufficient authority to accomplish recognized program objectives. For programs involving two or more DOD components, the component having dominant interest will designate the program manager. His charter shall be approved by a cognizant official within the Office of the Secretary of Defense.

The DOD components will be responsible for identifying needs and defining, developing, and producing systems to satisfy those needs. Component heads will also be responsible for contractor source selection, unless otherwise specified by the Secretary of Defense for a specific program.

The Office of the Secretary of Defense will be responsible for establishing acquisition policy, assuring that programs respond to valid needs, and evaluating policy implementation on each approved program.

The Office of the Secretary of Defense and DOD components will be responsible for program monitoring, but will place minimum demands for formal reporting on the program manager.

The Secretary of Defense will make the decisions which initiate program

commitments or increase those commitments. A Development Concept Paper (DCP) and the Defense Systems Acquisition Review Council (DSARC) will support the Secretary's decision making.

Conduct of Program

Underlying specific defense system developments is the need for a strong and usable technology base. This base will be maintained by conducting research and advanced technology effort independent of specific defense systems development. Advanced technology effort includes prototyping, preferably using small, efficient design teams and a minimum amount of documentation.

Program Initiation. Early conceptual effort will normally be conducted at the discretion of the DOD component until such time as the DOD component determines that a major defense system program should be pursued. The considerations which support this determination, together with a plan for that program, will be documented by the DOD component in a Development Concept Paper. The DCP will define program issues, including special logistics problems, program objectives, program plans, performance parameters, areas of major risk, system alternatives, and acquisition strategy. If approved, the program will be conducted within the DCP thresholds.

Full-Scale Development. When the DOD component is sufficiently confident that program worth and readiness warrant commitment of resources to full-scale development, it will request a decision from the Secretary of Defense to proceed. At that time, the DSARC will normally review program progress and make recommendations to the Secretary of Defense prior to his decision. Such a review will confirm:

- Need for the selected defense system, considering threat, system alternatives, special logistics needs, estimates of development costs, preliminary estimates of life-cycle costs, and potential benefits in context with overall DOD strategy and fiscal guidance.
- That development risks have been identified and solutions are in hand.
- Realism of the plan for full-scale development.

Production/Deployment. When the DOD component is sufficiently confident that engineering is complete and that commitment of substantial resources to production and deployment is warranted, it will request decision from the Secretary of Defense to proceed. At that time, the DSARC will again review program progress and make recommendations to the Secretary of Defense prior to his decision. Such a review will confirm:

- Need for producing the defense system considering the threat, estimated acquisition and ownership costs, and potential benefits in context with overall DOD strategy and fiscal guidance.
- That a practical engineering design, with adequate consideration of production and logistics problems is complete.
- That all previously identified technical uncertainties have been resolved and that operational suitability has been determined by test and evaluation.
- Realism of the plan for remainder of the program.

Program Considerations

System need shall be clearly stated in operational terms, with appropriate limits, and shall be challenged throughout the acquisition process. Wherever feasible, operational needs shall be satisfied through use of existing military or commercial hardware. When need can be satisfied only through new development, the equivalent needs of the other DOD components shall be considered to guard against unnecessary proliferation.

Cost parameters shall be established which consider the cost of acquisition and ownership; discrete cost elements, *e.g.*, unit production cost, operating and support cost, shall be translated into "design to" requirements. Practical tradeoffs shall be made between system capability, cost, and schedule. Traceability of estimates and costing factors, including those for economic escalation, shall be maintained.

Logistic support shall also be considered as a principal design parameter with the magnitude, scope, and level of this effort in keeping with the program phase. Premature introduction of detailed operational support considerations will be avoided.

Programs shall be structured and resources allocated to ensure that the demonstration of actual achievement of program objectives is the pacing function.

Technical uncertainty shall be continually assessed. Models, mock-ups, and system hardware will be used to the greatest possible extent to increase confidence level.

Test and evaluation shall commence as early as possible. A determination of operational suitability, including logistic support requirements, will be made prior to large-scale production commitments, making use of the most realistic test environment possible and the best representation of the future operational system available.

Contract type shall be consistent with all program characteristics including risk. Cost type prime and subcontracts are preferred where substantial development effort is involved. When risk is reduced to the extent that realistic pricing can occur, fixed-price type contract will be issued. Changes will be limited to those that are necessary or offer significant benefit to DOD. Change orders will be contractually priced or subject to an established ceiling before authorization, except in patently impractical cases. Systems will not be procured using total package procurement concept or production options that are contractually priced in the development contract.

The source selection decision shall take into account the contractor's capability to develop a necessary defense system on a timely and cost-effective basis. Solicitation documents shall require contractor identification of uncertainties and specific proposals for their resolution. Solicitation and evaluation of proposals shall be planned to minimize contractor expense. Proposals for cost-type or incentive contracts may be penalized during evaluation to the degree that the proposed cost is unrealistically low.

Management information/program control requirements shall provide information which is essential to effective management control. Contractor management information/program control systems, and reports emanating therefrom, shall be utilized to the maximum extent practicable.

Defense and Industry Must Do a Better Job

David Packard

We have made what I believe is a good start in delineating some new policies and procedures which will make it possible for the Defense Department and the military services to work more effectively with industry. I believe these new policies and procedures will enable the government to obtain more and better equipment for the billions of dollars of the taxpayers' money that are being spent. I believe also these new policies can result in a stronger, healthier defense-related industry in the future.

I can think of no time in recent history when it has been more necessary to do a better job in acquiring major defense systems. In the first place, there will be continuing pressures on the defense budget over the next few years which will certainly tend to limit the funds we will have available for new defense systems and equipment. These pressures have built up in part because of the growing anti-defense attitude in the country. Large cost overruns and other evidences of poor management by both the military services and industry contribute to this anti-defense attitude and make the job more difficult. There is no way to avoid this criticism except to do a better job in the future.

Some of the problems we face are characteristic of the times and there is not a lot we can do about it. We have had inflation and can expect some level of inflation in the future. The industry has a reduced business base and I can give you no promise that the defense portion of this base will significantly expand in the near time period. These are problems that we have to recognize and try to manage around but I believe the best we can do is minimize their effects. I don't believe they will go away.

I would like to outline some of the new policies and procedures which we believe will enable us to do a better job in the future. If these policies and procedures are to be effective they must be understood, accepted, and implemented by the military services and by industry. Improvement can only *begin* from policy pronouncements and directives that I may make. Improvement will be *achieved* only by actually doing a better job on specific contracts and specific programs. This raises a very important point. I am sure new policies and directives will not be perfect. It is important therefore that as the military services, working with industry, gain experience in these new approaches, we use this experience to further improve our policy guidance.

The first step for successful major defense systems acquisition is to make the right decisions in the beginning. To do so is not a simple matter. We must decide whether we will really need the capability the proposed system is to provide 5 or 10 years from now. We must decide this question, not on an absolute basis but on a relative basis. If we are halfway through the program and decide we don't need this as much as something else, under tight funding limitations, the program we have started may have to be dropped. This is a wasteful procedure and it has happened all too often.

Or, we may have a real requirement but it cannot be achieved because we have over-estimated the state of the technology. Sometimes a program is stopped for this reason. More often the development is continued and the cost growth continues too.

We are doing a number of things which we believe will enable better decisions to be made at the beginning of a major program.

First, we in the Defense Department are going to better describe and

David Packard
Deputy Secretary of Defense

understand what we want and need. As a part of this you can expect us to focus more on effectiveness and less on platforms. For example, in many cases it is just very much more efficient and practical to double the capability of weapons than it is to double the number of platforms to deliver the present weapons.

Secondly, we are taking a broader perspective on what we already have and what we might need. As an example, we are using the procedure of an area coordination paper. This type of document looks at a broad functional area such as air-to-ground munitions or space communications. We first describe what we want to be able to do within these functional areas, look at what we already have, and then identify what needs to be done.

Sometimes we find that rather than needing anything new we need less of what we already have. Individual military services may have developed duplicate capabilities simply because they were unaware, by circumstances or ignorance, of the full capabilities of another service's system. In other cases, this broad functional approach will permit us to really zero in on the actual type of capability needed.

We want to keep programs in advanced development longer, until we are sure we know what we are doing. We want to put more reliance on hardware and less on paper studies in advanced development.

This intent is apparent in every stage of development. As an example, the AX program is based upon competitive prototypes that will be built and tested before we approve this system for procurement or select a contractor. In the case of the B–1, there will be a prototype before we approve this system for acquisition. The Harpoon missile will be extensively tested and developed in pre-production form before production is approved.

Experimental Prototypes

We want to place new emphasis on a special kind of prototypes. During the current fiscal year, we want to establish a modest program of experimental prototypes. The common example that is frequently mentioned for this type of development is that of a lightweight fighter. This by no means describes the scope of what we have in mind. Experimental prototypes are equally applicable for rifles, ECM equipment, radios, hydrofoils, and many other areas of component and system development.

For most of the experimental prototypes, there will be technical uncertainty about the development. Frequently we will not have specific force structure objectives in mind, only generalized concepts.

Experimental prototypes should not be confused with pre-production prototypes, *i.e.*, production late in the engineering development cycle, when we have a good idea about the actual configuration for production. Experimental prototypes will precede, not be a part of, engineering development.

Finally, experimental prototyping normally will not be the basis for system procurement. We are all aware of the sole source difficulties were this not so.

Experimental prototyping projects should have one or more of the following characteristics:

- Support or satisfy an anticipated *future* military need.
- Significantly reduce uncertainties (technological, operational performance, costs, scheduling) in possible *future* developments.
- Provide *novel* and feasible operational/technological options.
- Offer the possibility of appreciably lower cost alternatives or techniques than those currently available or programmed.
- Have a *reasonable* (not "assured") chance of success.
- Have relatively low cost with respect to potential total program cost.

For industry, I believe this program will provide another incentive to develop systems and technology which might make a major contribution to our defense posture.

This type of development should permit us to look at substantially more pieces of hardware and different types of hardware. It will give us a better understanding of the capabilities of technology and provide a better basis for making decisions on our major programs by providing a means of exploring additional technological options. Finally, it will better permit us to retain and improve the competence of industry design and engineering teams. This approach should help us decide what we really want before we commit large sums to full-scale development and production.

Management Must Improve

As I reviewed program after program beginning in the spring of 1969, almost all were in trouble from a common fault—production had been started before engineering development was finished. I am sure you all know all about this problem. Several important policies and procedures have been established to help avoid the disastrous results of concurrency:

- We will not use total package procurement contracts on major programs.
- In general, major development contracts will be cost-incentive type and will require close working relationships between military service and industry managers.
- Fixed-price production contracts will be negotiated on major programs after the development has proceeded far enough that we know what we are to produce, and we know it will work the way we want it to work.

We have established procedures to assure that appropriate milestones of performance are established and are met before the program moves ahead.

What we are proposing is very simple: major acquisition programs will turn out better only if they are managed better. There is no better way to improve the management of a program than to get a better manager and give him the responsibility and authority to manage.

There is, then, some hope we can, working together—the military services, the Office of the Secretary of Defense, and industry—do this job of "Major Defense Systems Acquisition" the way this country should expect us to do it. I hope we will gain a better understanding of how to do the job the way it should be done.

I wish to emphasize that better management of these important programs is a responsibility above the parochial interests of the military services and above the selfish interests of industry. This would be a big challenge in times of rising budgets and enthusiasm for defense—it is an even greater challenge for us in this decade of the 1970s.

Research and Development of Defense Systems

Dr. John S. Foster Jr.

The processes by which we acquire weapons today determine the capability of our forces in the future—hence, our national security. Weapon system procurement practices of the past did not produce completely satisfactory weapons and systems for our fighting men in Southeast Asia. Some of our equipments were good; too many were unreliable; many were too hard to maintain. We can and must do better. We are in the midst of changing our procedures and policies to improve our efficiency. This is an evolutionary process that will continue.

The Secretary of Defense has made the hard decision to field a small modern force rather than a larger force that is qualitatively inferior for the same amount of money. Clearly, we cannot have a modern force without the necessary research and development dollars to make it so. We have requested an increased research and development program from the Congress. We may expect to receive this extra financial support only if we can demonstrate a substantial improvement in our conduct of research and development programs. Our research and development effort must have an output that is measured in terms of the quality of our new military products, their capabilities against an ever more capable threat, their cost to produce, and their reliability in the field.

We are now augmenting and expanding our program in the following ways:

- We are seeking new initiatives for our research and development program. Much of our research and development money is committed to programs that were begun years ago. This causes our budget to have a certain inertia as we fund out the research and development portions of older programs. Thus, the new programs just beginning must compete for a small share of the research and development dollars, and we must be especially wise in making our judgments. Roughly 30 new-initiative programs have been incorporated in the FY 1972 budget plan, and more are expected to be developed in the months ahead for the FY 1973 budget. Some of the most important initiatives are, in fact, elegant modifications to already fielded hardware; the slatted wing on the F–4 is a significant example of a large payoff for a relatively modest investment.

- We are now trying to put ourselves into such a position that in the future we really will have choices. Right now, we have so few programs that each one is individually and directly related to our near-term national security. That is the reason that we don't—or can't—cancel some programs with which we are not entirely happy. We can't afford to remain locked into a situation in which our only choices, *i.e.*, alternative ways of meeting accepted military needs, are not only few in number but expensive. If we are to have these choices, we must make more new program starts than we have in the past. Moreover, each of these new programs must be carried through with bounded financial commitments.

- We desire to emphasize the use of prototypes. The objective is to create a set of demonstrated advanced-technology options from which we can select programs to go into engineering development, or to retain in advanced development, or to stop. We are trying to create real program alternatives and flexibility throughout the entire acquisition process. We cannot base these decisions on paper analysis alone. We need experimental and prototype hardware to serve as a factual basis for our studies. Only by this means can we reduce the inherent risks in any development program.

- We are going to make step-by-step decisions based on the development status and demonstration of hardware. This approach puts teeth into our program of realistic operational test and evaluation. The point is to gain assurance not merely that the weapon system will meet the specifications, but that it will really be able to cope with the military program at issue. For this reason, we are making every effort to ensure that the weapon system is tested and evaluated in as realistic a manner as possible, with emphasis on two-sided engagements wherever practical.

- We are absolutely serious about stopping some programs. Those that have solid foundations, that perform effectively and meet timely needs, will go ahead to full development or production.

- We are absolutely serious about trading off performance, cost, and reliability as we move through the acquisition process. This means that we aren't through with tradeoffs when we start to bend metal. In this way, we will create for ourselves a situation in which we can realistically estimate and predict—and adjust, if necessary—development and production costs and schedules.

- We must generate new ap-

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Director, Defense Research and Engineering

proaches to old, as well as new, problems whose solutions must involve not only acceptable systems acquisition costs but also minimum costs of operation and maintenance. We cannot keep on developing weapons that are larger and more complicated and more expensive. Simply bigger and better weapons will not meet the basic selection criteria. The cost of development, acquisition, operation and maintenance is more a function of basic design than any other factor. It is critical that we avoid becoming so committed to a single line of development that, even if it gets into trouble, we have no option but to pour in money endlessly.

- We are committed to preserving our technological base and to maintaining an aggressive program in the forefront of such areas as materials, structures, aerodynamics, hydrodynamics, and electronics. We will continue to explore the unknowns in research and turn them into useful knowledge that can be exploited in advanced and engineering development. Industrial and government laboratories must maintain a high level of expertise and continuity in research and design. We are nationally committed to preserving this reservoir of talent, keeping teams at work building and testing advanced hardware, so that this resource will always be available to us.

To summarize our major approaches to the process of systems acquisition:

- We must keep feeding new initiatives into the research and development program.
- We must create options from which we can make choices.
- We must make a greater number of modest starts more often.
- We must begin development programs with smaller financial commitments until we know more clearly where we are going and what our technology will support.
- We must test hardware early and as realistically as practical.
- We must trade off performance against development costs, production costs, and operation and maintenance costs at all stages of our programs.
- We must use all of these activities in order to accurately predict the costs of subsequent development and production.
- We must advance the state of relevant technology as a basis for future options.
- We must recreate and preserve design-team expertise in government and industry.

From the industrial side, what does all this mean?

- It is important for you to continue making your recommendations either in the form of new initiatives or as plain, old fashioned advice.
- You could be searching hard for two types of people—the excellent designer or architect and the tough, hard-nosed manager.
- You might orient your independent research and development programs toward acquiring demonstrable hardware instead of publishing brochures.
- Under ongoing contracts, you might hold to the policy of scrutinizing your work for "frilly," nice-to-have features and removing them from the designs; and point out to us practical, logical tradeoffs that can reduce costs or improve reliability significantly, with minor impact on performance.

As you can see, there is no bonanza in this program. You may be correct in fearing that your business bases are contracting. You should view this prospect realistically. If our program is successful, the research and engineering portion of your business will be your last line of defense.

Production and Support

Barry J. Shillito

The new acquisition policy is oriented toward caution and the elimination of procedural rigidity in structuring contracts for our new programs. Under the policies of the recent past, the initiation of new programs was designed with a view to attempt to embrace the technical and management aspects wherever possible in a fixed-price type contract. Where the developmental risk was considered low, DOD sought to couple the initial development contract award with some part of the production program.

In retrospect, we recognize that the concept formulation/contract definition procedural apparatus did not provide an adequate basis for the necessary precision in pricing of contracts which is essential as a condition of fixed-price contracting. As we have seen, not enough of the uncertainties encountered in development could be removed before the initiation of detailed design and testing. Additionally, the result in the larger programs was that we competed too much of the program over too long a period of time. Risk could not be adequately assessed in order to equitably structure fixed-price type contracts. Once these programs were launched, sound tradeoffs were constrained within the contracting environment.

The concept of ordered sequences for development and production was certainly valid, but we often ended up with crash programs with fixed delivery schedules that resulted in concurrent development and production programs embraced in a single contract. So we must conclude that the premises which underlay the philosophy of fixed-price contracting for the development of major weapon systems were bad. The technical and the requirements underpinnings, which underlay those contracts, did not support the optimism inherent in management disengagement through fixed-price contracting.

The new philosophy does not emphasize a single procurement approach. Several important steps have been taken to provide a sounder basis for contracting. The over-emphasis on planning and programming to the exclusion of hardware development and testing, particularly in the critical high risk components and subsystems, has been corrected by emphasizing the need to demonstrate the solution to technical problems progressively as the development proceeds. Development milestones have been injected in weapon system contracts. Concurrency has been reduced by separating the contract for development from the contract for production. Increased emphasis has been placed on the use of prototypes before undertaking full-scale development.

Prototyping

In highly complex weapon systems, dual development or prototype contracting offers numerous advantages. Competition is maintained until advance development is substantially completed. We are not looking for just competition between sources but for competition between technical approaches as well. With two or more modest priced prototype systems in development, there is a greater chance for success. Under prototype development, we will evaluate hardware rather than paper promises in choosing a contractor, and we will have confidence that a proposed system will meet its performance objectives before substantial production commitments are made.

In cases where dual development of the total system is impractical, we feel sure that some advantages can be gained by parallel development of critical subsystems. We have done this recently and the results are encouraging. I believe that we can go much further in applying this approach to various lower level (sub- and sub-subcontract) high risk areas.

Prototype development will not solve all the problems of weapon system development, but it will reduce some of the risk.

The whole idea is to set the stage for more flexibility in effecting tradeoffs between performance, schedule and cost throughout the development phase. The contract methodology by which this is to be achieved is through the use of cost-plus-incentive-fee contracts which are tailored specifically to the risk inherent in each program. Since total package procurement has been eliminated, including the use of production options in development contracts, the risk to the contractor has been significantly reduced. We look at this as a more equitable balancing of risk which at the same time assures the government that the development objectives will be met before undertaking production.

Cost Control

We are not unmindful of the need to control costs and so we have emphasized the need for quality in the staff of our program offices to manage the procurement and development functions. In order to control costs, the managers will no longer be subservient to rigid schedules and operational requirements. Costs are to be controlled by continuous tradeoff analysis and program adjustments where necessary, duly reflected in changes to the contract. We recognize that one factor in cost control is to avoid, wherever possible, the use of letter contracts, and to avoid the authorization of changes either before they are contractually priced or some ceiling on the price has been established.

In addition to the concern for cost control on development contracts, there are two threads which run through every deliberation of the Defense System Acquisition Review Council (DSARC).

One is life-cycle costing—the concept that the price paid a contractor for a weapon system is only one element in the total cost of that system to the government. Every source selection decision must consider logistics costs: corrective and preventive maintenance; inventory management; training; inspection; installation and checkout; transportation; documentation; etc. Why not evaluate klystron tubes in terms of price *plus* service tooling cost divided by service life? The total-cost consideration makes sense for weapon systems as much as it does for parts, subassemblies, assemblies and minor subsystems. But the benefits of the life-cycle approach in acquiring weapon systems can be eroded if the concept is not adhered to in procuring subsystems, equipment and spares.

The second thread running through DSARC deliberations is the concept of integrated logistics support. By this, we mean that engineers must be motivated to consider the logistics environment in which a weapon system will operate—just as they consider weight, structural integrity, reliability, and performance. They must realize that the system they design and develop cannot be a good system if it is too difficult, or too costly, to support logistically. The logistician must be working with the designer to "design out" support needs.

For example, DOD spends about $20 billion each year to maintain $104 billion worth of systems and equipment. How much of this cost is caused by excessive, unrealistic maintenance requirements? How much might have been precluded by "building in" utility at the design stage? The answer could include greater use of plug-in-type assemblies; expanded application of the modular concept to entire vehicles like aircraft, missiles, tanks and even large ships and submarines; design of multi-location logistic support for engines and landing gear; development and use of materials impervious to corrosion; development and use of optical, ultrasonic, radiographic, or infrared devices for rapid inspection; development of less complicated trouble-shooting techniques; improvement and greater application of condition monitoring and "on condition" maintenance concepts. There

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(Installations and Logistics)

is no limit to the possibilities.

How does the DSARC know where it is heading logistically when it addresses any one of the three basic milestones in a weapons acquisition? It has a "road map" called the Development Concept Paper (DCP). DOD policy calls for the DCP to include the management plans for production, procurement, facilities and logistics. Unfortunately, these aspects have not been as fully and finitely treated in the DCP as they might have been. Policy for the DCP is being revamped and I am hopeful that the "new look" will put more emphasis on the production engineering aspects and other business management implications.

The problem for getting the markers on this "road map" to point the right way—and particularly for myself in assessing life-cycle costs or the implications of integrated logistics support—is the relative paucity of hardcore data on which to base a decision. The fewer the facts, the greater the conjectures—and, of course, the more serious the risk.

"Should Cost" Information

I am impressed that we have a statistic for practically everything but I frequently despair that we have so little meaningful data about anything. I would personally like to see less irrelevant information and more data that will help us develop meaningful insights into the problems that really bug us. For example, we need more data on the "should cost" value of the elements in a weapons system. This becomes particularly applicable when it is necessary to stay with the same source as we move from development to production. Past costs of non-competitive production items are not necessarily a good base point for launching negotiations—particularly when the production item has a history of cost growth. Rather, the government should look at the way the contractor conducts his business to eliminate non-productive and inefficient practices and procedures which may be present. In other words, the price that we pay ought to represent what the item should cost if produced with reasonable economy and efficiency.

We are beginning to lick the information problem—both in our contract operations and in-house.

On the contractual side, we maintain a presence in the plants of our major contractors. Where we cannot be present full time, we go into the plant and review selected aspects of its operation. A second technique which we are now developing is to use a team of experts to perform what has become known as should cost studies. These teams, composed of experts in procurement, industrial engineering, design engineering, accounting, legal, etc., are assembled where proposals are submitted for major weapon systems and we are not satisfied that contractor cost estimates are realistic. Such teams study the contractor's operation on-site for an extended time looking at such areas as industrial engineering standards, plant layout, production methods, purchasing systems, accounting systems and overhead structure. They document their findings and quantify the effect that recommended changes would have on the price for these items, assuming reasonable economy and efficiency. They get the contractor to agree to a management improvement plan to achieve economy and efficiency on a long-term and continuing basis. Frequently this can lead to increased profits.

I want to emphasize that the "team" approach does not result in just another functional analysis. The difference is that the integrated approach is a highly concentrated, intensive effort where great emphasis is placed on industrial engineering. Also, the scope of the inquiry is broader. The team may look at the contractor's entire business, or at least all of the business in the affected plant, as opposed to perhaps only a product line. The team technique puts our negotiators in a stronger bargaining position and thus helps us do a better job of pricing. We recognize, however, that this team approach is expensive and can only be used selectively as an aid to pricing major weapon system contracts.

On the in-house side, the stakes are even higher because the Defense Department spends more money in-house than it does on procurement from private industry. How do we know whether we are making progress towards our objectives, simply standing still, or getting farther away from them? We have a new procedure designed to provide surveillance over current and emerging logistics problem areas. This procedure is called the Logistics Performance Measurement and Evaluation System. This system will enable us to establish performance objectives for some 20 to 30 key logistics areas. It will enable us to measure progress against those objectives and to evaluate the results. It is showing us where to take corrective action and it prompts us to do so.

We have found this Performance System to be an important tool for top-management use. It provides us summary visibility of performance in key logistics areas; assurance that priority attention is being directed toward the correction of deficiencies; and identifies emerging difficulties before they grow into problems of major proportion.

Many of our procurement, production and logistics problems are the kind of barnacles that any large organization accumulates over the years. It seems to me that we can rid ourselves of these impediments by doing five things:

- Set clear, unequivocal policies that stop short of crossing every "t" and dotting every "i" for the men who must make the operational decisions. We are doing that.
- Rid DOD organizations of staffs that are remote from the actual operations but whose reviews and commentaries contribute to the problem rather than to the solution. We are doing that.
- Select the best possible managers on their records of performance and then keep them on the job longer. We are doing that.
- Let the managers who are selected know clearly what is expected of them, *i.e.*, pinpointing their responsibilities. We are doing that.
- Give those managers the authority they need to meet their responsibilities. We are doing that.

The men who buy our weapon systems, the cadres who man these weapons, and the managers who logistically support them are the people whose judgments and actions really determine whether our defense is good, bad, or indifferent. The policies, procedures, management systems, and organizations of the Defense Department must be alined to help them get their jobs done right.

Financial Environment of Defense

Robert C. Moot

For my contribution, I would like to touch upon our defense financial situation, some of the problems we face, and some of the solutions we envision.

Let us look first at the Defense Department budget—the problems and prospects. The public, and therefore the Congress, is in a frame of mind which generally leans toward reduced defense expenditures.

The situation, at first glance, looks like the opposite—an image of an increasing DOD budget. Our budget was $50.8 billion in pre-war 1964 compared to the $77 billion now before Congress; and it was $74.5 billion last year. By subtraction, this shows a $26.2 billion increase since 1964 and a $2.5 billion growth since FY 1971. It is understandably difficult to accept the Defense Department's statement that there is no more defense buying power in the $77 billion than was available eight years earlier for $50.8 billion. This image is not improved by what the public and the Congress apparently see as billion dollar busts in weapon systems acquisitions.

As compared to the general image, let's look at some figures. Figure 1 summarizes our FY 1972 budget by our 10 basic programs—plus the anticipated pay raises, which I have broken out because of their impact.

Two points I would like to make. First, note that "Strategic Forces" accounts for less than 10 percent [$7.6 billion] of the Total Obligational Authority. This is the figure we must keep in mind when we consider the possible impact of any Strategic Arms Limitation Talks (SALT) discussions. It is important to remember that the SALT deliberations are limited to only a portion of the total program covered by that $7.6 billion. As a result, it should be clear that the most optimistic results from SALT cannot generate any substantial reduction in our overall budget and certainly not within this fiscal year.

Another point relates to the impact of the Nixon Doctrine. It is true that this doctrine envisions smaller standing U.S. forces. However, it also provides for increased support of other nations and more modernized, up-to-date U.S. forces. Rather than major dollar reductions, at least in near term, its more logical impact will be a shift from manpower to force modernization and material support of our allies. The winding down of the Vietnam war is in keeping with the Nixon Doctrine and, while we expect to see the costs reduced, I must point out that the incremental cost of that conflict is now only about 10 percent of our expenditure, whereas it generates a great portion of the pressure to reduce our budget.

Defense Budget Summary

(Total Obligational Authority)

	Fiscal Year 1972 ($ Millions)		
Direct Force Programs		52.1%	
Strategic Forces	$ 7,639		
General Purpose Forces	24,278		
Intelligence and Communication	5,625		
Airlift and Sealift	1,139		
Guard and Reserve Forces	3,141		
Research and Development	6,096	7.6%	
Support Programs		34.4%	
Central Supply and Maintenance	8,721		
Training, Medical, etc.	13,650		
Administration	1,510		
Support of Other Nations	3,671		
Pay Raises/Volunteer Force	4,760	5.9%	
Subtotal Program Authority	80,230		100%
Change in Undelivered Orders, etc.	3,230		
Expenditures	**$77,000**		

Figure 1.

FY 1964 vs FY 1972

I have made the point many times that we really get no more defense in 1972 for the $77 billion than we did in 1964 for $50.8 billion.

Let's look more closely at the reasons why we have an increase of $26.2 billion in the budget. Figure 2 (page 10) lists specific documented cost in-

creases and distributes these costs by budget category.

Since 1964, the civilian and military personnel of the Defense Department have regularly received pay raises. The increased cost in the 1972 budget, as a result of these raises, is $12 billion. In addition, retired military personnel have also received seven cost-of-living pay increases since 1964, an increased cost of $2.6 billion. The $1.4 billion Volunteer Force Program is designed to attract and retain military personnel, largely through additional pay benefits.

Deliberate efforts in recent years to improve the grade structure of our military and civilian personnel are reflected in the next item of $2 billion.

Pay increases in Figure 2 total $17 billion—funds required in 1972 which were not needed in 1964. This is true of the entire $28.8 billion—no greater defense, but much greater cost.

We have another significant cost which must be funded in 1972 that was not present in 1964: the residual cost of the war. We are adding no new hardware or weapons; instead, we are expending ammunition and operating funds.

Overall, we must add $36.6 billion of costs to the 1964 budget before we have a reasonable comparison.

Figure 3 (page 12) reprices the 1964 force structure in the pay scales and prices contemplated in the 1972 budget. To provide the 1964 force level at 1972 costs would have required $87.4 billion 1972 dollars—the difference is the $36.6 billion itemized in Figure 2. Defense resources in constant buying power values are decreasing by more than $10 billion in 1972 budget prices.

With less buying power you would expect to see decreased forces. Overall, there is a sharp reduction.

Cost Growth Image

I mentioned earlier the image problem that cost growth creates for us. We have a management tool, the Selected Acquisition Report (SAR), for monitoring this problem within DOD and for reporting our status to Congress. We have selected 48 weapon systems to be monitored in the program. These 48 systems account for some $110 billion out of the estimated total value of $154 billion for all 129 weapon systems currently under acquisition. As you can see, we cover nearly three-quarters of the cost with less than a third of the systems—we believe that we have included the significant ones. Of that $110 billion, some 20 percent results from cost growth over the initial estimates. That amounts to a lot of money and it, therefore, contributes to our image problem.

This cost growth does not all result from waste or mismanagement. Causes of cost growth reflected in the March 1971 SARs were broken down into the following categories:

Categories	Percentage
Engineering/Capability Changes	20%
Extended Delivery Schedules	17
Abnormal Inflation	18
Erroneous Early Estimates	29
Other	16

The first category, "Engineering or Capability Changes," may include some goldplating, but most of it represents valid updating in keeping with state-of-the-art advances. "Extended Delivery Schedules" are not generally elective, but result from circumstances beyond DOD or industry control. As quantities come down and schedules stretch, costs go up. I am sure that none of us would have expected an 18 percent "Abnormal Escalation" rate. "Erroneous Early Es-

Pay and Price Increases FY 1964 to 1972

Annual Cost in FY 1972

	Total	Direct Force	Support	Capital	Research and Development	Retired Pay
Civilian Pay Raises	$ 4.6B	1.7	2.5		.4	
Military Pay Raises	$ 7.4B	5.0	2.3		.1	
Retired Pay Raises	$ 2.6B					2.6
Volunteer Force	$ 1.4B	.9	.5			
Military & Civilian Upgrading	$ 2.0B	1.3	.7			
FICA, VRB*, CHAMPUS**	.6B	.4	.2			
Purchase Price Increases	$ 9.2B	1.4	.8	5.5	1.5	
Congressional Pay Action	$ 1.0B	.7	.3			
Subtotal of Pay and Price Increases	$28.8	11.4	7.3	5.5	2.0	2.6
The Incremental Cost of the War	$ 7.8	2.5	2.8	2.5		
Total Increases	$36.6	13.9	10.1	8.0	2.0	2.6

*Variable Reenlistment Bonus
**Military dependents civilian health care program

Figure 2.

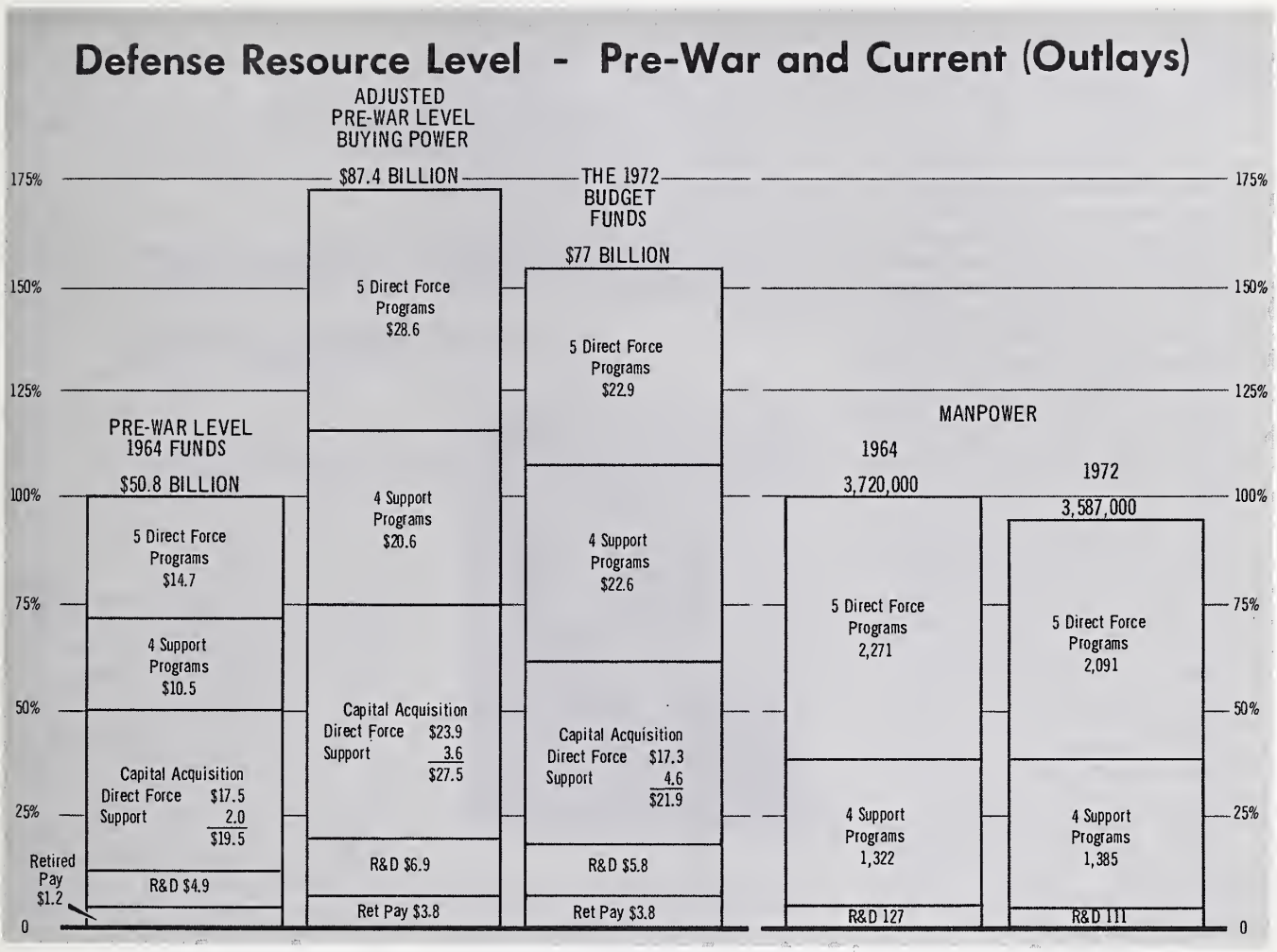

Figure 3.

timates" is the largest of the factors shown and, I think we would all agree, may be susceptible to improved management and certainly improved cost estimating. The "Other" is a catch-all and it probably includes items which we, in DOD as well as in industry, could reduce through more intensive management.

Since the cost estimating problem is so significant a slice of our cost growth, there is a current initiative directed toward improving our capability. We, in DOD, must shore up our internal cost estimating techniques. It is imperative that we acquire the ability to assess tradeoffs between system capability, cost and schedule, based upon reliable cost estimates. Deputy Secretary of Defense Packard has asked the Joint Logistics Commanders to sponsor a project aimed toward that goal. The study began in January with these objectives:

- Common data base.
- Standard definitions.
- Multi-purpose: program management, cost analysis, and pricing analysis.
- Satisfy total requirement (Office of Secretary of Defense and military departments).
- Data interchange.

They hope to develop a system which utilizes a common data base and is tied to standard definitions. The effort is oriented to contractor data for life-cycle cost estimating purposes, including material acquisitions and logistic support. Additionally, they seek to resolve internal DOD problems concerning data interchange.

To maximize effectiveness, the standard cost estimating system will provide data for multiple functions, including program management, cost analysis, and price analysis—for users in the military departments and the Office of the Secretary of Defense. This should eliminate the costly flow of data often proliferative and duplicative in nature between DOD and industry. Furthermore, it is intended to prohibit each user of information within DOD from imposing his unique data requirements on contractors.

Progress has been very satisfactory to date.

I know that you are familiar with the Cost Performance Report required by DOD Instruction 7000.8. [See article "Cost Performance Measurement," by Major Robert R. Kemps, USAF, *Defense Industry Bulletin*, Summer, page 42.] It is through this report that we, in DOD, monitor costs incurred in terms of work accomplished. The report compares actual

costs to the time-phased plan which represents the way the work is being performed. This time-phased plan, commonly called the "baseline," is oriented to the contract value, *i.e.*, the sum of the contractor's internal management budgets should add up to the contract target cost. It follows, then, that the target cost must be as realistic as possible since it is the basis for the contractor's internal budgeting and for cost performance measurement. One of the prime sources of occasional misunderstanding resulting from this reporting system comes about from our need to assure the accuracy of the data in the report. We expect that these data will come from the contractor's own internal management system—not from a separate add-on system. In order that we can be sure that the contractor's system provides the data we need, we have set up criteria against which to assess or validate his system. We do not specify the system. We do, however, need to validate the contractor's on-going system.

We have just gone through a major effort, also by the Joint Logistic Commanders, to review our practices and procedures in the application of these criteria, formally titled Cost/Schedule Control System Criteria (C/SCSC). This effort will culminate in a new, improved implementation manual directed toward uniform application of the criteria by all the military services. We confidently expect that this effort will result in great benefit to the defense industry through eliminating multiple validation effort and through common, reasonable application of the criteria. Most of our contractors have found the criteria useful or helpful. We expect the new approach to produce even wider industry support.

Robert C. Moot
Assistant Secretary of Defense
(Comptroller)

Defense Systems Management School

Educating a New Breed of Program Manager

Brigadier General Winfield S. Scott III, USA

The DOD weapon systems acquisition process is undergoing change. A key element in this changing process is the *program manager*. It has been recognized for some time that one way to improve the management of a process is to improve the manager responsible for its operation. Deputy Secretary of Defense Packard made this clear on Aug. 3, 1971, at the opening of the newly established Defense Systems Management School,* Fort Belvoir, Va., when he said: "as we sought to discover reasons . . . and to find ways for improvement, several conclusions came to the surface . . . if we wanted better management of these important programs, we must have better managers in charge . . . it was clear to me that putting better managers in charge would do more to bring about improvement than anything else."

DOD Directive 5160.55 chartering the school established a challenging mission to:

> **Educate selected military and civilian personnel in program management, conduct research into new concepts and methods to improve program management, and disseminate this new found knowledge to the practicing manager.**

Most interesting of all to commercial industry and past program managers will be the outcome of this program; its product will be a new breed of program manager who has been educated differently. This difference is expected to manifest itself in three major ways.

First, as a result of the type and level of education received in management, the program manager of the future will view more objectively and treat more realistically the real world issues and problems. To achieve this, the 20-week program manager course work is based largely on the case study method, taught at the graduate level. Bringing this instruction to the student, along with a highly selective faculty, is a host of consultants and guest lecturers from government, industry, and the academic community. The emphasis throughout is on *practical* and *applied* management, without unduly stressing or falling into the "management by regulation" syndrome.

The program manager of the future is different in a second way in that his education at the school will emphasize a "forward look." This forward look will include the ability, courage, and desire to seek *new, innovative,* and *improved* ways of managing weapon systems acquisition. The educational philosophy of the Defense System Management School embodies a hard-nosed approach in preparing the individual to meet demanding decision situations. He will be familiar with risks, techniques to assess uncertainty, and the necessity for making the right decisions despite the presence of uncertainty. He must be willing and able to meet the challenges of tough decisions. In effect, the student will develop the ability to search out problems, recognize opportunity, and work out solutions in the acquisition process. In the freedom and safety of the classroom he will have the time and capability to implement *his personal, creative* approach to these problems.

The third distinguishing characteristic of the newly educated manager (destined for program management) has two facets: the man himself and the curriculum by which he is educated. First, the individual to be selected to attend the course will be unique. He will be younger and of lower grade than previous students—either a major/lieutenant commander

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**The Defense Systems Management School has replaced the Defense Weapon Systems Management Center formerly located at Wright-Patterson AFB, Ohio.*

or lieutenant colonel/commander, or the equivalent civilian grade of government and industry, who possesses a proven record of performance. In each case, the individual will have demonstrated a high level of competence in his field. He will have indicated a sincere desire for the necessary education to become a professional manager. Such rigid criteria are essential for achieving the goal of developing capable managers to manage the programs of the future.

The next feature of the program is the curriculum by which the student learns. The word "integrated" well describes the approach taken. The focus of the instruction is on the weapon system acquisition cycle. Each student is thrust into classroom situations where he can actually experience the atmosphere of a program manager's office. Thus, he experiences the practicalities of areas such as office management, system support, cost estimates, threat analyses, mission analyses, sensitivity analyses, conceptual decisions, and a multitude of other areas which occur in the life cycle. Instruction is based on a simulated weapon system that involves the student in each phase of its life cycle. Each individual will have a chance to develop and apply *his* decisions in order to evaluate *his* effectiveness and efficiency in managing the system.

Supplementing this course work on the weapon system are courses of instruction aimed at developing quantitative skills, qualitative abilities, and specific functional area knowledge relating to management areas such as procurement and contracting, planning, programming, and budgeting, and others. These all provide the potential for developing a more broadly based, competent program manager for the future.

More importantly, the aforementioned objectives, when coupled with both outstanding students who are highly motivated and dedicated to careers in management and an eminently well qualified and experienced faculty, will make the Defense Systems Management School ". . . the Academy of Management for the [Defense] Department and for all four [military] services. . . ." This was the goal set by Secretary Packard when he addressed the students, staff, and faculty on opening day.

The Auditor and Performance Measurement

E. Joseph Hill

Effective management requires the development and execution of a well conceived plan for optimum use of resources, including the establishment of standards against which the use of these resources may be measured and controlled at various levels of operation. To be effective, such plans, expressed quantitatively as budgets, must be complemented by an accounting system and a related reporting system. The accounting system reflects the results of budget execution, *i.e.*, what actually occurred, expressed as incurred costs. The reporting system evidences the activities recorded in the accounting system in relation to the budget, and serves as the basis for evaluating present status and weighing alternatives with respect to future actions. In total, the foregoing constitute a contractor's financial management system.

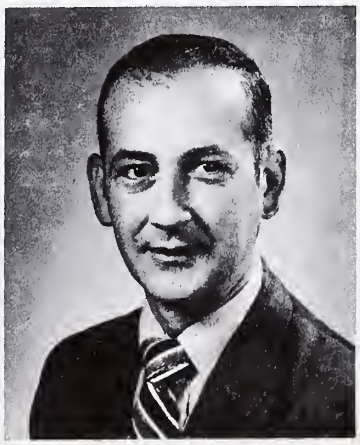
The importance of a properly functioning financial management system to the effective performance of a major weapon system contractor has been recognized by the Defense Department in DOD Instruction 7000.2, "Performance Measurement for Selected Acquisitions." The provisions of the instruction are applicable to *selected* contracts within acquisition programs estimated to require cumulative financing in excess of $25 million for research, development, test and evaluation or cumulative financing in excess of $100 million for production. DOD Instruction 7000.2 is also applicable to selected subcontracts as agreed upon by DOD and the prime contractor. Basic criterion for selection is the criticality of the subcontract to the acquisition program. Firm fixed-price contracts are excluded from the provisions of the instruction.

The intended objective of contractor performance measurement is to provide an adequate basis for responsible decision making by both contractor management and DOD components (military departments and defense agencies). To accomplish this objective, management control systems must provide data which:

- Indicate work progress.
- Properly relate cost and schedule performance.
- Are valid, timely and auditable.
- Supply DOD managers with a practicable level of summarization.

Implementation of the financial management and other disciplines required by DOD Instruction 7000.2, or Cost/Schedule Control Systems Criteria (C/SCSC) as it is commonly designated, is the contractor's responsibility. Logically, it is intended that the system be the one used by the contractor to manage all contracts, not a corollary or duplicate system employed solely for use on the C/SCSC-required contract. When implemented, the contractor's system is subject to validation by a military department or a team representing the three military departments. The team is composed of various professional and technical specialists to assure, among other things, that the contractor's budget planning, execution, and related financial management procedures are in consonance with the regulatory criteria. As a logical extension of the validation process, the government also maintains surveillance of the contractor's operation of his management system during contract performance, to ensure continuing compliance with the procedures as originally validated.

The Defense Contract Audit Agency (DCAA) is one of the agencies that assists the military departments in monitoring the financial aspects of contractor progress in the implementation and operation of performance measurement systems. By its charter, DCAA is charged with furnishing financial advice on procurement matters to the various elements of DOD. This responsibility extends to participation in those DOD-directed programs requiring the specific training and skills of the contract auditor as they relate to the financial operations of DOD contractors.



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DCAA Role in C/CSSC

In August 1970, the military departments published the Cost/Schedule Control Systems Criteria joint implementation procedures.* This action established a uniform set of procedures and methodology for all the military departments in planning and implementing the performance measurement criteria. At the present time, these procedures, as well as the provisions of DOD Instruction 7000.2, are being reviewed by a panel established by the Joint Logistics Commanders at the direction of Deputy Secretary of Defense David Packard. However, it is not expected that any revisions resulting from this review will affect the responsibilities of the auditor enumerated in the present procedures pamphlet.

In brief, current procedures require the cognizant DCAA audit office to provide an auditor as team member during demonstration reviews for the purpose of validating contractors' management control systems (Phase I). A DCAA auditor is also a team member during the surveillance of the contractor performance management system (Phase II). Duties of the DCAA auditor during these two phases are:

Phase I (*Demonstration*).

- As a demonstration review team member, review the contractor's accounting system and related areas, *e.g.*, budgeting, variance analysis, and forecasting.
- Participate in monitoring contractor progress in assigned areas of C/SCSC implementation.

Phase II (*Surveillance*).

- Review contractor's accounting system policies and procedures for compliance with performance measurement criteria and contract provisions.
- Periodically review, on a selective basis, financial data contained in the various reports prepared by contractor to determine whether it accurately reflects the information contained in contractor's books and records.
- Periodically evaluate effectiveness of contractor's financial policies and procedures.
- Prepare audit reports incorporating deficiencies disclosed during surveillance reviews that cannot be resolved with the contractor. Such reports are made to the procuring activity through the cognizant contracting administration services office.

However brief the foregoing responsibilities appear, they do encompass a significant portion of those duties normally performed by the auditor in the review of contractor performance on all flexibly priced contracts awarded by DOD and, incidentally, by certain non-DOD agencies.

C/SCSC Validation and Surveillance

With respect to validation of the contractor's system, DCAA is expected to, and does, assign an auditor to the demonstration/validation team. The purpose of this team is to assure that the program performance measurement system is operating as described by the contractor, and that it is adequate as measured against the criteria. Generally, the audit function will be to ensure that:

- The work breakdown structure is compatible with the contractor's method of cost accumulation and allocation.
- Costs to be accumulated and reported to the government through the Cost Performance Report, or its equivalent, are compatible with other reporting media such as the Contract Funds Status Report and the Cost Information Report.
- Data reported is accurate, complete and provides a mechanism for recognition of actual or anticipated changes in estimates to complete. This data can be pivotal in a subsequent decision regarding redirection of effort to be expended, revision to the work statement, and increased or decreased program funding.

After the system is validated, surveillance reviews are performed to ensure continuing compliance with appropriate performance measurement contractual requirements. Here again, the auditor functions as a member of a team, responsible primarily for the financial aspects of the performance measurement system. Where deficiencies are disclosed, they will be discussed with contractors' representatives and reported to the contracting officer for prompt disposition.

DOD Instruction 7000.2 does not specifically require contractors to submit performance measurement reports although many reports prepared for the contractor's own purposes may be used by DOD components. However, DOD Instruction 7000.8, dated April 1, 1970, specifically requires the use of the Cost Performance Report on new contracts selected for application of the performance measurement criteria. Regardless of the type of report used in reporting cost/schedule performance, the auditor selectively reviews reconciliations made between the Cost Performance Report or its equivalent, the Contract Funds Status Report and the Cost Information Report. To conform to the criterion stated in DOD Instruction 7000.2, these reports must be reconcilable. Where irreconcilable differences exist, they are brought to the attention of the contractor and the contracting officer. Early correction of differences is necessary to ensure that the various levels of DOD procurement action are receiving valid, accurate information for data bank purposes and for monitoring and evaluating the status of contract funds.

Pivotal Areas of Concern

From the auditor's viewpoint, there are a number of areas in performance measurement which would appear to be pivotal to the success of the performance measurement system and, accordingly, are of primary interest. Among these are the contract baseline, contract changes, estimates to complete, variance analysis, and evaluation of prime contractor surveillance of subcontractor efforts.

The *performance measurement baseline* is the contractor's time-phased budgetary plan against which contract performance is measured.

The extent of audit evaluation of baseline activity occasioned by replanning efforts, contract changes, and the use of management reserves will depend on the adequacy of the procedures employed by the contractor. Among the multitude of factors which may influence or otherwise affect pro-

The procedures are contained in a tri-Service pamphlet titled, "Cost/Schedule Control Systems Criteria (Joint Implementation Procedures)," AMCP 37-5, NAVMAT P5240, AFSCP 173-3, Aug. 26, 1970. The pamphlet is available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; order no. D301.35/3;173; price 70¢.

cedural adequacy are:

- Discipline followed by the contractor in adhering to the system.
- Number of work packages involved.
- Duration of work packages.
- Extent of level of effort and apportioned effort.
- Multitude and timing of changes to the baseline occasioned by changes to the contract work statement(s).

Once the effects of these variables are determined through the demonstration review and early stages of surveillance, a somewhat static but still flexible surveillance plan can be developed.

Contract changes probably represent one of the major concerns of both the contractor and DOD in the operation of a successful performance measurement system. Here, there is a problem of assimilating the value of changes under fluctuating conditions, particularly the multitude of changes which can be expected in a major weapon system development.

There may be several stages in implementing contract changes. The first, the pre-authorization stage, occurs when the need for a change becomes apparent. There should be no change made to the baseline at that time. The second stage is "pre-firm," at which time the government authorizes the change to be made and an estimate of the cost is developed and entered into the system. The third stage, the pre-negotiation stage, which may be a lengthy period of time if both the government and the contractor do not exert efforts to negotiate promptly. Obviously, the final stage occurs subsequent to negotiation when changes, if necessary, are made to cost amounts entered into the performance measurement system in stage two.

A major problem could occur if the value of changes finally negotiated is significantly different from the value of changes previously entered into the system, and a greater problem if changes are not *promptly* entered into the system. Under these conditions, it would be difficult to analyze differences between the value of the work planned and the value of work actually accomplished, defeating the purpose of the cost/schedule performance measurement system by obscuring the very visibility intended by the system.

The auditor, as a member of the surveillance team, is expected to ascertain that the contractor's personnel give timely and appropriate recognition to pending contract changes which may affect the contractor's subsequent cost or schedule performance, as well as the estimated cost at contract completion. Early recognition of required changes provides both the contractor and the government more flexibility in effecting any necessary tradeoffs between cost, schedule, and technical planning.

One of the most important aspects of C/SCSC is the requirement for a monthly submission of a current estimate of total cost to contract completion as part of the Cost Performance Report. In the initial stages of contract performance, the contractor's *estimate to complete* may be predicated primarily on the simple arithmetical difference between costs incurred to date and the original contract budget. However, as work progresses and experience is acquired, estimates to complete can be made with greater visibility. The need for a current, periodic cost review increases in direct proportion to the probability that the estimate of total contract cost will differ appreciably from the budgeted figure.

Accordingly, the auditor's responsibilities are to:

- Ascertain whether the frequency of contractor reviews of contract status and development of revised estimates to complete is appropriate.
- Evaluate the estimates to complete by review of data input and the judgmental factors used by the contractor.

The auditor is responsible for ensuring that factors used in developing estimates to complete are consistent with other facets of the contractor's estimating and budgetary system. For example, labor and burden rates estimated for a future period in the Cost Performance Report should be the same as the rates used for proposals on other work in the same cost centers. Because of the integration of schedule and cost performance and the relationship between planned effort and technical requirements, the auditor's efforts in this area are closely coordinated with government technical personnel.

Another major aspect of the performance measurement system is the *determination of variances* between work planned and work accomplished, both for schedule and cost performance. The Cost Performance Report provides for such determinations on a monthly basis. This report also requires contractor comment on significant problem areas, reasons for variances, their impact on the program, and corrective action taken or to be taken.

Any comments with respect to the importance of recognizing and giving prompt attention to variances would be rather academic since the sole purpose of the variance reporting mechanism is to point out actual or potential problems, or undesirable conditions. It is sufficient to state that both the contractor and the government are aware of the need for early analyses of variances to preclude a cumulative effect that might occur if problems or undesirable conditions are allowed to go uncorrected.

Audit responsibilities with respect to variances are to evaluate the procedures used by the contractor in analyzing the more significant variances and to effect corrective action; and to ensure that actions taken or planned are timely and responsive to the needs indicated. Auditors must also be alert to the possibility that a proliferation of variance reports may be such that it renders the system difficult to cope with from the manager's point of view. In these situations, audit recommendation may be made emphasizing the need for selectivity and a reduction in the number of variance reports.

Generally, it is the prime contractor's responsibility to validate and maintain *surveillance of subcontractor* performance measurement systems. Where the prime contractor has accepted this responsibility, the DCAA auditor will evaluate the *prime contractor's* continuing surveillance to ensure that the prime is establishing the propriety of the subcontractor's input data and determining whether the subcontractor's system is continuing to function as originally validated by the prime contractor. The auditor will also review the timeliness of subcontractor reporting and subsequent incorporation of re-

(*Continued on page 39*)

Landing Force Logistics

Major General Herman Poggemeyer Jr., USMC

"Land the Landing Force!"

This traditional order issued by the naval officer commanding an amphibious task force is the signal to conduct one of the most complex and demanding military operations—the projection of power ashore from the sea.

The combination of airpower, seapower, and power associated with land operations is blended into an operation that is without question one of precision, daring, and chance. The placement of forces ashore in sufficient depth to engage hostile defensive forces, and the need to build behind the assault force the sustaining power to exploit breaches in defensive positions are key features of amphibious assaults. Providing logistic support for an amphibious assault is as challenging a task as is executing the assault itself.

The logistics problem is one of structuring a force to ensure that it has the capability both to conduct an assault operation and to sustain it for some *indefinite* period thereafter. Trying to plan for "indefinite periods" with requirements that must be answered in finite terms is a paradox we will probably always face. It is the heart of the logistics challenge to the planning processes.

Whatever the situation, whether today or tomorrow, an assault force placed ashore must have a high probability of accomplishing its mission. While most of today's problems are concerned with the realities of today's world, today's decisions must also offer some guarantee of success in tomorrow's missions.

Theoretically, mid-range and long-range planning processes are convenient ways of removing one's self from the effects of the current environment. Practically speaking, this does not always work. Mid-range plans (0 to 10 years from now) and long-range plans (10 to 20 years from now) do provide useful time increments to predict conditions, but they are influenced very heavily by the decisions and actions of today.

Kahn and Wiener, in "The Year 2000," stressed this point. They said that the most important reason for speculating far ahead is to try to predict conditions in reasonable detail and to evaluate how outcomes depend on current policy choices. They went on to say that among other things studies relative to the future broaden horizons, increase creativity, and, most importantly, effect basic beliefs, assumptions, and emphases.

It is clear to me that, as we resolve today's problems, it is an absolute necessity that we condition ourselves to considering the long-range effects of our decisions. The only practical way of achieving this as a "reflex action" is to be exposed to a proper and balanced mix of current and predicted problems. In this regard, I hesitate to

categorize this analysis as current, mid-range, and long-range planning. I see no definable increments. For example, as we consider resources for mobility, some of our motor transport items are programmed for the Fleet Marine Forces through the next 10 years; our new tracked amphibious assault vehicle will be with us for 20 years; and the new general purpose amphibious assault ship, LHA, will probably be influencing our operational and organizational concept beyond 1990. Yet all of these must be complementary components of a viable and evolutionary system. All of this illustrates the accommodations that have to be made to accept the fact that tomorrow's system is shaped by decisions made today. Decisions made on the basis of today's problems alone are expedient ones.

Planning for the Future

A few years ago, it was conventional to "derive" a system. With a realistic threat postulated and a set of forces matched to the threat, one could describe a logistic system suited to the operational and organizational structure of the forces. Now and in the immediate future, the more likely approach is to match the forces and the logistic system to a budget level not necessarily related to the threat. Tendencies to de-emphasize the threat appear stronger every day. This attitude, familiar to all, results in reduced allocations of national resources to defense needs. The logistician, as well as the procurer, stock piler, and custodian of materiel, has a vital and influential role to play in the future preparedness because he places the price tag on forces. Thus, in the current trend for budgetary development, it seems that the *threat will not drive* the force structure, *the price tag will.*

Whatever military posture the military assumes in the post-Vietnam era, it will be based on that portion of national resources which is allocated for national defense. This situation is not now. One merely has to review the writings of one of our contemporary scholars, Dr. Bernard Brodie in his "Strategy in the Missile Age," where he refers to strategy as wearing a dollar sign. None of us should be puzzled by the normal turn of events. Traditionally, less is spent for defense when defense forces are unemployed. In such a situation, our only recourse is to tax our imagination and ingenuity to the utmost using our talent to produce the best possible system with the available allocation of national resources.

The future Marine Corps force structure and its logistic system will be influenced by the dollar sign. Whatever new operational concepts are developed, they must queue up for judgment on both operational and cost factors, with heavy emphasis on cost. This is a dilemma of the first magnitude. Decisions to adopt new operational concepts must withstand the real constraints of the dollar. The decision process can be illustrated by some current Marine Corps projects evaluating operational concepts which may ultimately be determined primarily on the basis of available dollars.

Several years ago, the Marine Corps advanced a concept of operation which was judged to be appropriate and advisable for 1985. New weapons that were technologically feasible in that period were identified, together with an operational and organizational concept for the employment of such weapons. Next, as a part of this continuing study effort, the Marine Corps completed a supporting study that described a seabased mobile logistic system to support a Marine amphibious brigade in a crisis control operation in the 1985 period.

Upon completion of this study, a companion study was needed to determine the structure of a logistic support system in the 1985 time frame for a conventional Marine amphibious force ashore in subsequent operations. The seabased logistical requirements of a Marine amphibious brigade and the conventional Marine division/wing operation ashore would provide us with the necessary extremes to make valid decisions today that will facilitate evolutionary achievement of our 1985 objectives. However, we are now in the process of finding that we may have *already made decisions* that, *because of costs*, appear irreversible.

It is possible, on the basis of current and programmed requirements, to determine with creditable degree of assurance in the 1970s the weaponry that will be in our inventory in 1985. This can be done without reference to a new operational concept. When we bring in a new operational concept, as we have with a long-range plan, it is necessary to match a set of notional weapons to fit the concept. Given the set of notional weapons, a comparative analysis must then be made with the weapons that are expected to be in the inventory because of the sheer momentum caused by today's programming decisions. Decision points are reached that force us either to back away from our desire to change the operational and organizational concept where programmed weaponry so indicates, or to change weapons. These decisions must also be made in an environment that is heavily influenced by dollar availability. The consequences of such decisions will ultimately result in the type and availability of weapons our successors will inherit.

I again emphasize that it is extremely naive to think of current, mid-range and long-range planning as three separate compartments. Today's decision maker must frame his thoughts so as to effectively influence all three.

Characteristics of Future Logistic Support Systems

Chances are good that the logistic support system in the long-range period will not actually be as we see it today. I would not call this bad planning, but rather a recognition that unplanned events normally occur which produce modifications to our projections, predictions, and plans. World situations, accidents, national leaders, and other variables will have such a dramatic and drastic influence on the future that they will, by brute force, change the system regardless of the best possible planning efforts. Nevertheless, some very clear signals are discernable for use in developing the post-Vietnam logistic system. I will identify these points in general terms, and will then discuss some of the concepts of logistics useful in support of combat situations associated with projecting power ashore from the sea.

There appear to be four significant features that a logistic support system must incorporate or consider in the future. These features are born in today's environment and compensate

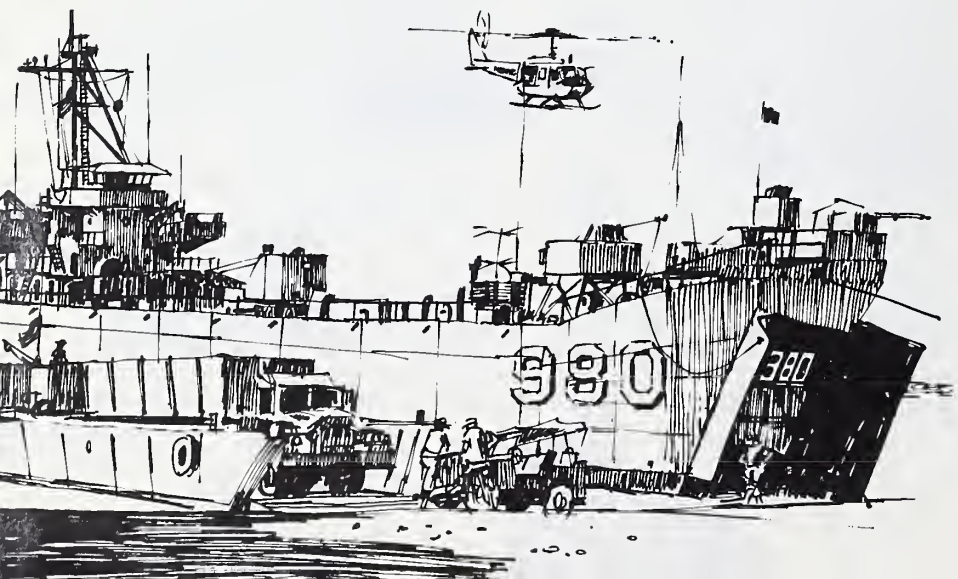
for trends in national emphasis. They are:

No Redundancy. Redundancy will be reduced to an absolute minimum. Backup transportation systems, dual communication networks, multitargeting, etc., are costly. True, redundant systems and material enable one force to overwhelm another. Reducing redundancy will probably result in making the term "overwhelm" obsolete and in its place will be substituted a term such as "margin of defeat." This poses the challenge initially of minimizing the loss of key systems in those situations where redundancy is not permitted on the basis of sheer cost. Subsequently, we must develop contingency plans to provide realistic and responsive interim measures to ensure the continuity of operations.

Logistic Discipline. The logistic support system, or any other system for that matter, will require a high degree of discipline. The large undisciplined logistic system, which evolved during World War II, was only effective because of the sheer volume of materiel which sustained its momentum. Today, the reliance on more intricate weaponry and a much more sophisticated control network, from the seat of the Government at times, demands a closer control of resources. Effective use of the computer, sound operations, and systems analysis techniques will help to achieve the measure of discipline essential to this future logistic support system. We can also be sure of less materiel, less time for repair, and less managerial talent to control resources. All of these are indicators that our patterns for control will be more precise and less forgiving of errors.

Measured Conservatism. Budgetary constraints will require that our initial applications of force and support resources be made with measured conservatism. True, the tested principles of applying force by surprise, unencumbered by constraints of size and cost, appear to be still valid for subsequent actions. However, the freedom to use vast quantities of troops and supplies initially has been drastically curtailed. With full knowledge of the cost of our instruments of defense, it appears prudent that their employment be subjected to cost effectiveness criteria. This decision process leads ultimately to the arena of national policy where basically this is the question to be answered many times: "Is involvement worth the price?"

Sustainability. A most essential characteristic of a future logistic support system, especially during periods when the national mood is being focused on non-military problems, is sustainability. Commitment of forces in the future may be required almost instantaneously. Support of engaged units must be maintained until lines of communications are established and the production base tempo matches and exceeds the capacity for consumption in the objective area. We generally treat this as a pipeline problem. I wish it were that easy. The pipeline analogy infers that a one-way hose is connected to the combat theater from a source of production and material is pushed through it. In reality, an extremely complicated network of pipelines and control apparatus is necessary. Some materiel can go unpressured, while other items require highly specialized and controlled routes to move them. Basic to the future process of linking the supplier to the combat theater will be both the reliance upon existing stocks and the lift available to move them at the start of a conflict. The margin of success or failure will be determined by our ability to estimate consumption and predict when production will exceed losses.



Mid-Range and Long-Range Concepts

The most essential characteristics of future logistic support system requirements must be carefully weighed and balanced in the development of our plans to ensure that we obtain the adequate, flexible, and responsive support when and where it is required.

It has been conventional in the past to land elements of combat service support organizations with our assault units. Gradually, at a pace determined by the landing force commander, these combat service support units are expanded to provide logistic support to our engaged forces. Eventually, large complex facilities become established ashore including warehouses, maintenance facilities, computer installations, etc. In reality, advanced naval bases were established.

The Navy and the Marine Corps are actively pursuing an operational concept that features the projection of forces ashore from the sea without the attendant large scale logistic buildup ashore. Keeping many of the logistic support functions at sea, perhaps in a specifically designed, missioned-oriented ship, appears to be an attractive option to the alternative of

establishing extensive logistic support facilities ashore. Without the requirements to establish and protect these facilities, the landing force commander can concentrate his resources on his main objective, the enemy's ability and determination to fight. This new concept, called the seaborne mobile logistic system (SMLS), is characterized by the following features:

Minimum reliance on maintenance facilities ashore. Maintenance of equipment and weapons will be performed by "contact teams" of specialists dispatched ashore under the control of a logistic support commander. The contact teams are made up of individuals or small groups of Marines who are highly specialized maintenance technicians and repairmen. The concept of sending technicians to "contact" the equipment that is inoperative in the field, as contrasted to bringing the equipment back to a repair shop, is the theme we are stressing. This concept applies to equipment maintenance that does *not* require sophisticated and time-consuming service. Heavy reliance will be placed on providing forces ashore with replacement items rather than repairing their defective equipment. Our modeling efforts have indicated that an astounding degree of operational readiness of combat units can be maintained with a modest investment in spare equipment for replacement purpose, while defective equipment is in the repair cycle.

Minimum materiel is phased ashore. Recognizing the highly mobile characteristics of the force ashore, the bulk of the logistic support materiel will be kept poised at the ready—at sea. Deliveries ashore will be based upon the tempo of combat operations. Again, our simulation models indicate that a practical level of supply ashore can be as small as two days, as long as the system is flexible and responsive to high priority supply requirements.

In summary, our complete program for future logistic support systems is fully integrated with our operational plans and the Marine Corps is endeavoring to color today's decisions to reflect tomorrows goals. While we may not hit our goals because of the costs involved and the politics of change, we have at least set objectives toward which we continue to push.

I quoted Kahn and Wieners "The Year 2000" earlier, and it seems appropriate to close with some more of their works.

> **"One problem of long-range speculation is that the subjective curve of probabilities often seems flat. This is, no particular course of events may seem much more likely than a large range of others. In order to avoid the dilemma of Buridan's ass, who starved midway between two bales of hay because he could not decide which one he preferred, we must then make arbitrary choices among almost equally interesting, important, or plausible possibilities. That is, if we are to explore any predictions at all, we must to some extent 'make them up.' Clearly, the most salient of the projections we can make is one that is 'surprise free'; nevertheless it would be very surprising if in any thirty-three year period the real world did not produce many political and technological surprises."**

Needless to say, the Marine Corps does not intend to starve.

"Land the Landing Force."

Major General Herman Poggemeyer Jr., USMC, was Assistant Chief of Staff, G-4, Headquarters, U. S. Marine Corps, at the time this article was written. He is now the Assistant Base Commander, Camp Pendleton, Calif. General Poggemeyer served as Assistant Chief of Staff, G-4, from September 1970 until August 1971, and was Deputy Assistant Chief of Staff, G-4, for two years. Before that he was Assistant Chief of Staff, G-3, 1st Marine Division, FMF, in South Vietnam. General Poggemeyer is a graduate of the U. S. Naval Academy.

Updating the ASPR

Karl W. Kabeiseman

The Armed Services Procurement Regulation (ASPR) is the principal procurement regulation of the Defense Department. It represents the most comprehensive and emulated procurement regulation in government today. Firmly founded in statute, ASPR is issued by direction of the Assistant Secretary of Defense (Installations and Logistics) pursuant to authority delegated to him by the Secretary of Defense and contained in Section 2202 of Title 10, U.S. Code. All officers and agencies of DOD obligating appropriated funds for purchasing equipment and supplies must comply with ASPR. It is DOD's implementation of the Armed Services Procurement Act of 1947 now codified in Chapter 137 of Title 10 of the U.S. Code. It has the force and effect of law.

ASPR is a big book by any standard. Its very size and complexity, however, only mirrors the incredibly complex business of buying in government today. ASPR policy and procedures must be flexible and comprehensive enough to translate national policy, as contained in statutes, executive orders, judicial decisions and other controlling directives, into specific guidance for each DOD buying office. It must cope with problems of buying everything from commercial ball bearings and breakfast cereal to the most sophisticated technology required to develop a new weapon system.

ASPR is a widely distributed regulation. About 54,000 copies are printed by the Government Printing Office. Approximately half of these are for use within the Defense Department. The others are sold by subscription to contractors, libraries, and other customers. In addition, ASPR is printed in Title 32 of the Code of Federal Regulations and by at least one commercial publishing house.

Although there have been many changes, the ASPR process, rather surprisingly, has remained fundamentally the same for more than 15 years. The Armed Services Procurement Regulation Committee has been officially responsible for writing and revising ASPR since 1955. During this period, ASPR has grown from a small, very general statement of procurement policy to a comprehensive statement of procurement guidelines and procedures of more than 3,000 pages, plus 5 supplements, 14 appendices and 2 manuals. In addition, Defense Procurement Circulars (DPCs) are issued periodically to transmit ASPR changes requiring immediate action and important policy statements of a non-regulatory nature.

Two projects contributed to the rapid growth of ASPR. These two projects alone added over 2,000 pages. The first, called Reduction in Implementation (RIP), resulted from a 1963 directive of Secretary of Defense McNamara that the individual Army, Navy, Air Force and Defense Supply Agency procurement publications be consolidated in ASPR. The objective was to reduce the total volume of procurement publications in DOD and to eliminate unessential differences between procurement policies and procedures of the military departments.

The second project stemmed from a 1964 decision of the Secretary of Defense to create a single DOD contract administration organization (the Defense Contract Administration Services [DCAS] of the Defense Supply Agency). It then became necessary to standardize contract administration policy and procedures. ASPR served as the vehicle to assure a common understanding of the duties and authority of contract administration offices. It also established uniformity in many routine administrative matters to facilitate automation of contract administration services, *e.g.*, standardized contract numbering and contract line item numbering.

The ASPR Process

Because of its impact, volume, and complexity, ASPR and the ASPR

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process are continually being reviewed and revised to assure responsiveness to the needs of DOD. Changes to ASPR, whether additions, deletions, or modifications, are written or approved by the ASPR Committee. The committee consists of a chairman designated by the Assistant Secretary of Defense (Installations and Logistics) and representatives from the military departments and the Defense Supply Agency. The chairman is a military officer, colonel or Navy captain, and traditionally is selected from the military services on a rotation basis. An executive secretary, who is a career civilian on the staff of the Office of the Assistant Secretary of Defense (Installations and Logistics), provides staff assistance and continuity to the committee. In fact, A. B. Carter, who recently retired, served as Executive Secretary of the ASPR Committee for almost 20 years.

Each of the military departments and the Defense Supply Agency appoints two members to the committee. One member is a lawyer and the other is the procurement policy member. The normal tour for members of the committee is from two to four years. The committee members are the personal representatives of their respective department Secretaries and take final action for them, except when a Secretarial meeting is requested. This unusual procedure will be discussed later.

The committee ordinarily meets in the Pentagon at least two full days each week. A printed agenda for each week is prepared in advance by the executive secretary. The agenda lists the subjects to be considered by subject and case number. A case is numbered by the last two digits of the calendar year in which the case is initiated, plus its numerical sequence that year, *e.g.*, 71–132 is the 132d case introduced in 1971. The case identifies the problem from its introduction until finally resolved by publication in ASPR or rejection.

New cases arise from a number of sources, chiefly from DOD procurement personnel who have problems. Each department has a specific method for bringing such problems to the attention of their ASPR Committee members. Generally, anyone in the department may submit his recommendation through channels to his ASPR Committee representative. Individuals or organizations outside of the Defense Department may simply send a letter containing problems or recommendations to the Chairman, ASPR Committee, Office of the Assistant Secretary of Defense (Installations and Logistics), Washington, D.C. 20301. If the suggested change reflects careful study and justification and appears to have merit, the committee will act on it.

Last year over one-half of the cases originated in the Office of the Secretary of Defense. The Defense Supply Agency was the second most frequent source of new cases. New or revised policies of the Secretary of Defense and his staff, statutes and executive orders, decisions of the courts and of the Armed Services Board of Contract Appeals, reports of the General Accounting Office, and suggestions of contractors and industry associations are the most frequent causes for new cases to be introduced.

The agenda for each week is distributed to the ASPR Committee members at least three weeks in advance of the meeting date. The members use this time to coordinate the agenda items with their principal buying activities and procurement staff offices, soliciting comments and recommendations. This is the time during which the individual members prepare for discussion of the case at the ASPR Committee meeting.

On the day the agenda is considered, the sponsoring member usually provides background and argument for adoption. This is followed by informal give and take among the committee members until the chairman notes a consensus or asks for a vote. Each department, including the Defense Supply Agency, which is included in the term "department" for the purposes of ASPR and this article, has one vote. The decision of the committee is determined by majority vote.

Subcommittee Role

At this early stage of consideration, the question is usually whether a problem exists that requires an addition, deletion, or change to ASPR. Because of the large committee workload and the size of ASPR, the committee has been taking an increasingly critical look at each new case in an effort to avoid non-essential changes. Thus, the case may be rejected at this stage unless a significant problem is recognized. If the case has merit, it is usually referred to a subcommittee composed of experts on the specific subject. There are standing subcommittees for the more active sections such as for cost principles, government property, small business, and cost or pricing data. If the case relates to a less active subject, an ad hoc subcommittee is designated by the members. These subcommittees usually consist of one or more representatives from each of the departments. The subcommittee is directed to provide a report to the full committee usually within 30 to 60 days depending on the complexity of the problem assigned. If, after study, the subcommittee determines no action is necessary, an ASPR change need not be recommended.

The current ASPR Committee Chairman, Captain E. C. Chapman, USN, recently emphasized to all subcommittees that an ASPR change is not always required just because a case has been assigned. Frequently the best recommendation a subcommittee can make is "leave the book alone."

After fact finding, study and drafting are finished by the subcommittee, the subcommittee's report is included on an agenda and the same advance notice and coordinating procedure are followed as when the case was introduced. When the committee considers the subcommittee report, the subcommittee chairman and members may be present but usually are not, since the reports normally provide a complete discussion of the problem. The ASPR committee members will normally have resolved issues with their counterpart department subcommittee member prior to consideration of the report. The committee at this stage again has several alternatives. It may reject any change, either based on the subcommittee recommendation or on its own initiative. The case can be returned to the subcommittee with specific questions or instructions or, as is more often the case, the subcommittee report will be adopted with or without modification. If a change in ASPR is rejected or approved for printing, this can be the final disposi-

tion of the case. However, if major policy is involved the committee-approved action is referred to the Assistant Secretary of Defense (Installations and Logistics) for approval prior to publication.

When one of the departments takes strong exception to the committee's proposed action, the Assistant Secretary (Installations and Logistics) of the military department or, in the case of the Defense Supply Agency, the Director, can submit a memorandum requesting a meeting of the Assistant Secretary of Defense (Installations and Logistics), the Assistant Secretaries of the military departments, and the Director of the Defense Supply Agency to personally resolve the issue. A recent Secretarial meeting considered proposed changes to ASPR negotiation guidelines opposed by the Air Force.

The ASPR Committee works closely with the staff of the Federal Procurement Regulation. Special efforts are made to assure formal advertising procedures, forms and provisions are identical, if possible. Also, the Chairman of the ASPR Committee is a member of an interdepartmental procurement policy committee.

Coordination with Industry

All proposed ASPR materials having significant impact on contractors, such as a revised contract clause or a change to the Section XV, "Cost Principles," are sent to 17 industry and professional associations for review and comment. At least 60 days are normally provided for this review. Participating associations include the Council of Defense and Space Industry Associations, National Security Industrial Association, Electronic Industries Association, Aerospace Industries Association of America, Inc., American Bar Association, Financial Executives Institute, and others. The proposal is also provided to the General Services Administration for coordination among the civilian agencies, and to the Atomic Energy Commission, National Aeronautics and Space Administration, and to the General Accounting Office.

The comments of the associations and other government agencies are then considered by the subcommittee with instructions to either adopt or reject the suggestions made and provide justification for rejecting any suggestion. This subcommittee report is again put on an agenda and normal agency coordination within the Defense Department is obtained. When the committee considers the subcommittee report at this stage, primary emphasis is on industry and agency comments. The proposal may be approved as submitted by the subcommittee or as modified by the ASPR Committee, or the committee may reject the case based on new information furnished or it may again return the case to the subcommittee with instructions. In unusually troublesome cases, a substantially revised proposal may be approved and coordinated again with industry associations and civilian agencies. ASPR provisions relating to certified cost or pricing data and the catalog and market price exemptions of the "Truth in Negotiations" Act are examples of this careful coordination before a final ASPR provision was approved.

From the foregoing it should be clear that ASPR changes are not lightly made. The process is designed to elicit the best in experience and knowledge. This is done at the expense of moving quickly. When necessary, however, the process is responsive to urgency. The ASPR Committee has drafted and published guidance in a matter of a few days or even hours when necessary to implement a new statute or an executive decision. The suspension and reimposition of the Davis-Bacon Act, the postal strike, and the Executive Order on wage/price control are examples of situations that required and received immediate attention by the Committee.

Improving the ASPR A Continuing Effort

Among the more recent and significant studies of the ASPR system are the 1970 report of the Blue Ribbon Defense Panel and the 1971 DOD-wide Committee that considered the panel's recommendations. The Blue Ribbon Defense Panel recommended a review of the ASPR Committee system with the objective of formulating a more efficient management organization for incorporating changes into ASPR and with a view toward reducing the volume and complexity of ASPR.

A special DOD-wide Committee was appointed to make the review. After a detailed study, this committee unanimously concluded that the present ASPR system is fundamentally sound. It did, however, make several suggestions for improvement. The recommendations included:

- Development of a summary of overall ASPR policy.
- Provision of a permanent editorial staff.
- Improvement of the ASPR index.

The DOD-wide Committee also suggested that consideration be given to consolidating all material of interest to base procurement personnel, limiting revisions to one a year, re-issuing ASPR totally every three years, further limiting the use of Defense Procurement Circulars and issuing the circulars in a format with a single subject to a page to permit interleafing with ASPR.

The ASPR Committee has the development of the first recommendation, a separate policy section, well underway. The new policy statement is intended to serve as a foreword to ASPR and as a general summary of the principal procurement policies of the Defense Department as reflected in ASPR.

A number of other suggested improvements in ASPR are also underway or planned. Perhaps the most obvious is the reduction in the number of ASPR revisions. Only two revisions were issued during the past year instead of the bi-monthly revisions previously issued. The volume of the two revisions, however, was larger than would have been necessary with more frequent changes. Also, it was necessary to publish more material in the Defense Procurement Circulars. The large volume of the semi-annual revision and the obvious delay caused by less frequent changes are matters of some concern.

Volume and Readability

There are also renewed efforts to reduce the volume and improve the readability of ASPR. In reducing the volume of ASPR, the chief concern is that material removed from ASPR does not show up elsewhere—in other publications or, even more discouraging, in several other publications. Special efforts to improve the readability of ASPR have been made in the

past. ASPR is not written in an informal "chatty" style, and with good reason. It is essential to be precise and complete in drafting contractual language and implementing statutes. ASPR contains much of both of these. Preciseness is also important in the light of judicial decisions holding ASPR to have the force and effect of law. ASPR manuals, on the other hand, are not regulatory in nature and so much less formal writing is found, for example, in the Pricing Manual. Clear communication, however, is essential and the planned editing capability could certainly improve the readability of ASPR.

While not everybody needs all of ASPR and, indeed, very few people refer frequently to more than a few sections, no satisfactory way of providing separate and limited publications has been devised. Appendices and supplements as defined in ASPR 1–103.6 and manuals, such as the pricing and small purchases manuals, are an attempt to put material of limited use or applicability in separate documents. Additional consideration is being given to separate publication of those parts of ASPR frequently incorporated by reference into contracts, *e.g.*, Section VII and XV and Appendices B and I. It has also been proposed that solicitation provisions in Section II and III be authorized for incorporation by reference and be available in a separate publication. The proliferation of separate publications, however, raises serious problems of updating, cross referencing, overlapping, and identification.

In addition to the action recommended by the DOD-wide Committee, the ASPR Committee on its own initiative is undertaking a review of all approvals specified in ASPR. This review is aimed at challenging the necessity for each approval or review requirement in ASPR with the objective of deleting the requirement or, when that is impossible, of lowering the administrative level of the required approval. Over the years, the authority of the contracting officer has eroded in many respects. This effort should result in substantial additional authority being returned to the local level, particularly to the contracting officer.

Other self-improvement ASPR Committee projects underway include efforts to expand the notes and filing instructions accompanying ASPR revisions to explain more fully the reasons for changes. More attention is being given to the lead time required before the effective date of new clauses and procedures. This is part of an overall attempt to provide better understanding of ASPR changes. Communication is the essence of the regulation and the ASPR Committee has been painfully aware that unless new provisions are understood they will be ineffective. Thus, in the case of new provisions relating to subcontractor cost or pricing data, the ASPR Committee members held a series of meetings throughout the country with procurement people and contractor representatives explaining the new material and answering questions.

What the Future Holds

Although the ASPR system is time tested and fundamentally sound, there are significant changes ahead. The repeated self analysis by the committee and periodic critical reviews within DOD have served to continually improve the system. However, like all things of man, it is not perfect.

The Commission on Government Procurement is giving extensive attention to procurement regulations and their formulation. The possibility of a single procurement regulation for all Federal departments and agencies is receiving serious consideration. Proposals to make ASPR and other procurement regulations subject to the rule making requirements of the Administrative Procedures Act have been gaining support. These requirements include a 30-day advance notice published in the Federal Register and an opportunity for interested parties to comment and to initiate changes.

Although imposing these requirements could have farreaching effects on many regulations, the ASPR procedures already provide unusual opportunity for comment by interested parties outside of Government. In addition to the coordination procedures previously discussed, a quarterly briefing for industry association representatives on the status of ASPR cases is held at the Pentagon. The ASPR Committee also holds open day-long sessions with representatives of industry three or four times a year in various parts of the country. These provide local companies, small business concerns and subcontractors in particular a chance to present their views and recommendations. Some of these discussions are quite lively and all are informative. During these trips away from Washington, the ASPR Committee also visits local DOD purchasing and contracting offices. Exchanges during these visits are most helpful to the committee in better understanding local problems and to the local people in gaining an insight into the reasons for recent ASPR changes.

In Summary

The ASPR Committee system is unique. No other regulation provides for so much direct participation in its development by those it regulates.

It is dynamic, yet the ASPR Committee approach to writing the regulation has remained fundamentally the same. Changes to ASPR frequently take a long time, but they can be made rapidly in response to urgency. Through extensive coordination within the Defense Department, with other government agencies, and with industry, it distills the combined experience and knowledge of the entire procurement community.

The ASPR itself is continually evolving. Its volume and complexity are cause for concern. Many improvements are underway, and more are planned, but its quality will continue to depend on the active interest and participation of those who use it.

Air Force Parts Control Program

Lieutenant Colonel Gordon L. Carpenter, USAF

Since 1964, the cost of parts has been recognized as a major factor in increasing acquisition costs of new weapon systems. The extreme complexity of new systems and their high replacement cost caused more emphasis on reliability to increase operational time between failures, reduce maintenance costs, and increase safety for operational and maintenance personnel. The emphasis on these factors placed severe requirements focused on the parts level and, in turn, generated broader environmental requirements and caused parts to be exposed to even tougher conditions.

When DOD Directive 4120.3, "Defense Standardization Program (I&L)," dated April 23, 1965, was reprinted in 1967, standardization emphasis was changed from supply to design. This new approach required that standardization be considered early in system design as a function of the system engineering process. To meet the new requirements of DOD Directive 4120.3, the Air Force Systems Command developed a Parts Control Program. The program recognized and corrected problems in updating military specifications or developing new specifications when the system requirements dictated a need for a new generation or type of parts. Up-to-date military specifications reduce the necessity for individual contractor-developed parts.

Contractors have in the past been required to screen military specifications and standards to determine whether parts were already available to meet requirements of the systems being designed. In some cases, parts defined by military specifications and standards could be used, but military standard parts could not meet upgraded design requirements. In more complex, highly reliable systems being developed, parts had to be developed according to contractor-derived specifications.

The problem of flooding the Air Force inventory with non-standard parts started because of inadequate military specifications for parts. When awarded a contract for a major system, a contractor, not having the expertise or feeling that it is more economical not to develop all the hardware for the system, in turn, subcontracts for design and development of certain subsystems or equipment. This results in varied subcontractor identification of similar parts which perform like functions in separate subsystems or equipment. Such practice produced an inventory of a multitude of new or non-standard parts developed by each subcontractor in a weapon system program.

How To Stop the Flood?

How could this increase in non-standard parts be controlled? Increased reliability was necessary, but a way had to be found to keep down costs in the Air Force systems acquisition process.

In the F–111 program, the prime contractor reviewed all the new generations of parts already in use. However, the parts used previously either were too expensive or would not meet requirements. With no other alternative, the prime and subcontractors were allowed to develop drawings to define the parts, resulting in the identification of 220,000 non-standard parts to support the F–111 program. This excessive number of non-standard parts threatened a serious increase in development and logistic support costs.

The Air Force Systems Command, with a contractor team, determined that wider use of military specifications would stem parts proliferation in the inventory. Uncontrolled use of contractor specifications had created a costly problem not only to the equipment manufacturers and their vendors, but to the Air Force. One example of the cure was a new series of military specifications developed to identify performance requirements of highly reliable semiconductors. The specifications, called "TX" for "Testing Extra," required 100-percent testing, such as "burn in," screening to increase quality and reliability of the parts. Military specifications were now available to identify the same parts for which avionics equipment manufacturers had previously prepared hundreds of separate contractor specifications.,

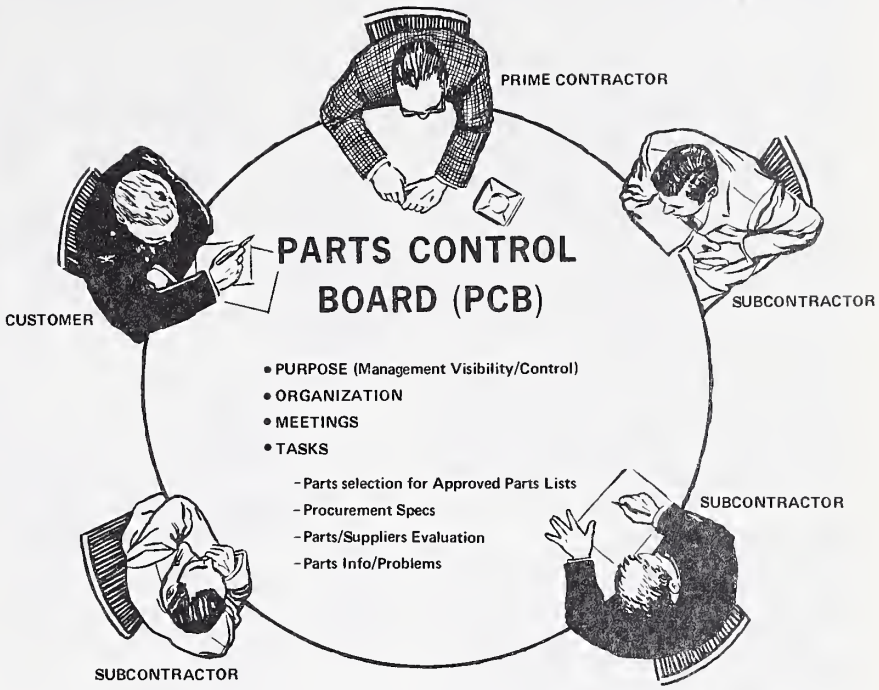
Development of the TX specifications eventually reduced non-standard parts in the F–111 program, but it was done *ex post facto*. The military, after reviewing the parts requirements on the F–111, determined that the parts needed by the F–111 were also required by other programs and,

therefore, over 90 percent of the part types were developed into military specifications. Various subcontractors had already developed the design and completed contractor parts specifications. This meant that some redesign and change in documentation had to be accomplished in order to convert to the TX military specifications. On a few items in the F–111, major redesign would have been necessary to use the new military specification parts. Judging that redesign would not be economical, the contractor in some cases elected to keep the non-standard part. However, during reprocurement, some subcontractors on the F–111 elected to change to military specification parts because of continued high cost of procuring to contractor drawings, thus further reducing the non-standard parts.

Parts Control Board

Under the Air Force Parts Control Program, requirements for parts are determined during the design phase of a system. As long as the contractor can select parts covered by military specification, parts control works automatically. These common usage parts are documented by a single military specification, resulting in cost savings through increased volume buys and competitive procurement.

Lacking military specifications, each individual prime and subcontractor in an acquisition program develops parts specifications and documents them according to his own method. These parts enter the Air Force inventory as different parts even though procurements are made from the same vendor.



The Air Force Parts Control Program requires the prime or integrating contractor to organize a Parts Control Board. A representative of the prime or integrating contractor serves as chairman of the board and representatives of all major subcontractors serve as members. The government designates an advisor to the contractor's Parts Control Board to provide logistics information and assistance in the revision or development of military specifications.,

The contractor's Parts Control Board (PCB) provides management visibility and control by reviewing all parts selected for use in the system. It is the contractor's organization which consolidates parts requirements for the total system. Tasks of the PCB are to:

- Approve the parts selected for use in the program, thus ensuring the use of reliable parts.
- Develop or review procurement specifications for military publication.
- Evaluate parts suppliers for placement on the qualified product list.
- Exchange information of parts application data and parts problems.

Subcontractor members of the PCB represent their companies in all PCB meetings and activities. Through them, the system prime contractor can ensure that parts requirements are consolidated to provide common usage in the program. As a general rule, when two or more subcontractor procurement specifications are required for identical or similar parts, they will be consolidated for recommendation as a military specification.

In such an instance, a draft military specification or a recommended change to an existing military specification will then be submitted to the government for incorporation into the Defense Standardization Program so it can be used by any defense contractor.

Program control exercised through the Parts Control Board can be computerized by the prime contractor so very little detailed day-to-day operations are required. Computer evaluation of the equipment parts lists against the program approved parts lists will provide an up-to-date list of all parts approved versus candidate parts which require action. Computerized control will also provide consistency in parts documentation, and discrepancies in the number and types of

Lieutenant Colonel Gordon L. Carpenter, USAF, is assigned to the Office of the Deputy Chief of Staff, Systems, in Headquarters, Air Force Systems Command. He is responsible for electronics standardization and is project director of the AFSC Parts Control Program. Before his assignment to AFSC, he served as Air Force member of the Aeronautical Standards Group of the Departments of the Navy and Air Force. He holds a bachelor's degree in mechanical engineering from the Missouri School of Mining and Metallurgy, and a masters in electrical engineering from the University of Colorado.

parts can be easily detected before program procurement actions are initiated.

One of the most important advantages of the Parts Control Program is that it makes the Defense Standardization Program responsive to needs of contractors based on the requirements imposed at the weapon systems level by the Air Force. This means that as new technology is needed to meet the requirements of the system being developed, the changes it imposes at the parts level will be added to the Defense Standardization Program for use by any defense contractor. This in turn, ensures that new technology is added to the standardization program when it is needed to support weapon systems.

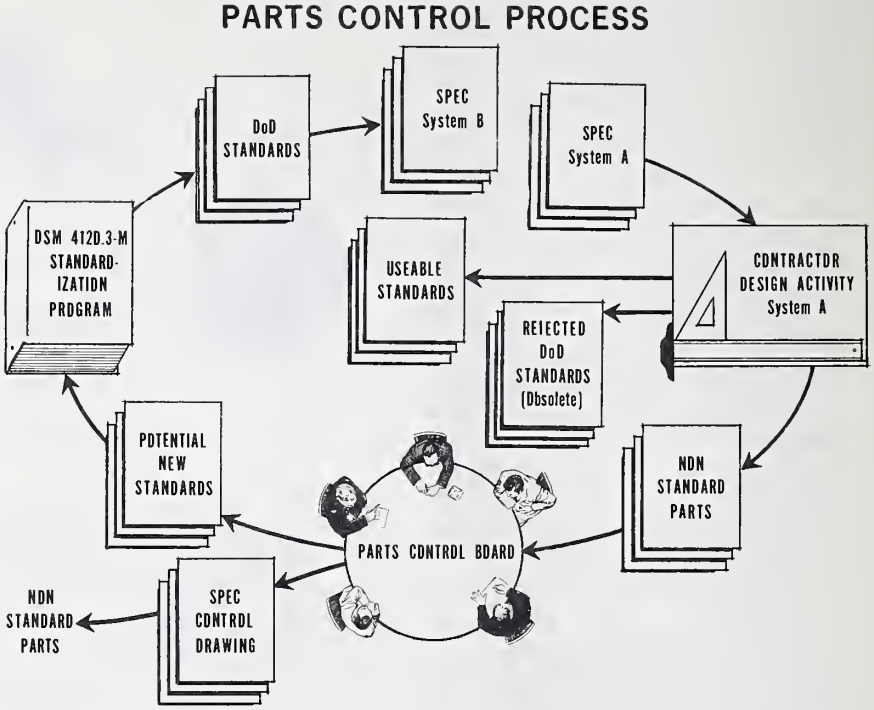
Parts Control Application

The Air Force Systems Command plans to include parts control and standardization responsibilities in all applicable contracts containing requirements for new design of equipment and systems. To assure that parts control is considered in all contracts, current Air Force regulations are being updated to assure that procuring activities review all pertinent requirements in the proposed system acquisition to determine whether a parts control program should be applied to the program being acquired. To accomplish systematic procedures for parts control, a military standard, MIL–STD–891, was developed. It ensures that the Parts Control Program is implemented properly in the contract and, with the statement of work, will reflect the contractor tasks to be accomplished.

Currently, MIL–STD–891 parts control procedures apply only to large system acquisitions. However, methods for a "less-than-system" application are now being developed and will be added to the military standard. This will allow project offices to select between a less-than-system or a system approach to parts control, whichever is applicable to the contract being awarded.

Benefits

The benefits of the Parts Control Program cannot be easily analyzed, but they are consistent with mass production philosophy and the competitive spirit of industry. Examples



of specific areas show that significant savings are being achieved and, logically, these benefits accrue during the entire life cycle of the hardware. Success of pilot tests in the F–111 and C–5 programs in reducing costs led to inclusion of parts control as a contractual requirement in the F–15 program.

Benefits of parts control can be divided into three categories of program costs:

- Acquisition costs.
- Logistic support costs.
- Life-cycle costs.

Acquisition costs are reduced by eliminating the need for contractor drawings which identify similar parts, reducing parts costs as a result of increased competition and volume buys within a program, and reducing the lead time to acquire parts from qualified vendors.

Logistics support costs are reduced through less cataloging effort, less maintenance of Federal Stock Numbers, less salvage of inventoried items, and less expensive but better quality replacement parts.

Life-cycle costs are reduced through lower failure rates and through consolidation of requirements by eliminating part types. Consolidation of part types results in less varied stockpiles at supply sources. Since these parts are military specification items, other defense contractors can also use them in subsequent designs, thereby increasing standardization in replacement parts. In turn, unit costs of replacement parts for maintenance of systems will be reduced by DOD-wide volume procurement.

Thus, through parts control effort, new generations of military standard parts can enter the inventory. With the availability of military standard parts, each subsequent program derives benefit from the previous program. The F–15 program derived benefits from parts control effort taken during the design phases of the F–111 and C–5. For example, if military specifications for resistors, capacitors, and semiconductors had not been updated for the F–111 and C–5, and without parts control effort, the F–15 program would have required development of over 8,200 contractor-developed detailed part drawings at a cost of over $8 million. Since military specifications were available, this cost was avoided.

In the microelectronics area, de-

tailed military specifications could not be developed for the F–111 and C–5 in their design phases. Since then, however, a procurement specification for microelectronics has been developed and has made possible the preparation of detailed military specifications for the F–15. A preliminary analysis of F–15 requirements for microelectronic parts indicated a need for over 1,400 drawings. The F–15 Parts Control Board is preparing military standard specifications for microelectronic parts. Because the detailed military specifications were not available before final documentation of some of the equipment design, about 700 contractor-developed specifications will be required. However, in the provisions of the microelectronic devices, many of the parts now defined by a contractor drawing will be converted to a military specification part.

The parts control concept was not initiated until late in the design phase of the F–111 program. Therefore, the military specifications on parts were not developed until after the parts had been defined in contractor drawings. This allowed an opportunity to compare price quotes from vendors based on military specifications and contractor drawings, respectively. Using seven representative diode types required in the F–111 avionics package, the price per part averaged about three times higher for the part identified by the contractor's drawing. These cost differences can be easily verified by a vendor. Each part identified by a contractor drawing has to be handled by the vendor during his production run as a separate and distinct part since the testing, marking, and identification of that part is slightly different from other parts identified by contractor drawings, even though the part is essentially the same. Using the total parts population in the F–111 avionics for these seven types of diodes, the parts control action taken by the F–111 contractors for these seven diode types saved the Air Force over $5 million.

Looking at the logistic aspect of cataloging and maintenance of Federal Stock Numbers, the Defense Supply Agency through the Defense Electronic Supply Center, Dayton, Ohio, developed a mathematical model to show what cost savings could be accrued by not having to award separate stock numbers for parts. This mathematical model considers many aspects required to support that Federal Stock Number over a five-year period. Using that mathematical model and applying it to seven general parts specifications which have been updated or developed due to Parts Control Board actions on the F–111, C–5 and F–15 to date, over $13 million have been saved. These figures do not reflect the savings which will occur by increased use of the parts by other defense contractors, nor the cost reduction on each part due to increased volume buys and increased competition.

Government support to the Electronics Federal Supply Group type is now being provided by the Defense Electronics Supply Center as an agent for the Air Force. The center not only integrates the draft military specification into the Defense Standardization Program, but also provides the Parts Control Board logistics and procurement information. Plans are underway to expand the Parts Control Program into certain mechanical parts. The F–15 program already has some mechanical parts under consideration by its Parts Control Board.

DOD-Wide Parts Control

Success of the Air Force Parts Control Program has been a major factor contributing to Congressional interest and support from the Office of the Secretary of Defense. Deputy Secretary of Defense David Packard stated that parts control effort would be applied by all the military departments as soon as detailed procedures could be developed. Subsequently, the Deputy Assistant Secretary of Defense for Production Engineering and Materiel Acquisition directed that pilot tests on parts control in each military department be started as a first step in developing an integrated DOD-wide parts control system.

The Air Force Systems Command, working with the Defense Electronic Supply Center, is proceeding with the application of electronic parts control to all applicable new systems. The Air Force is also proceeding with plans to expand the program into certain selected mechanical parts. Methods for applying parts control to less-than-systems are now under investigation and pilot tests are being conducted.

In the development of our weapon systems, the old adage, "A chain is only as good as its weakest link," is particularly apropos. Parts make up the system and *all parts* are required to meet a system's requirements.

All failures of defense systems can be attributed to failure of some *part* not meeting its design requirement.

To support military operational commitments in this austere budget era, we must concentrate on the system and all its *parts* to ensure that system costs are reasonable, and that the system performs within its design and performance parameters. Every place where costs can be reduced means that the defense community can accomplish more for the defense dollar and provide better and more efficient protection for this nation.

Navy Has Planning Documents for Industry

Lillian L. Morris

Military readiness requires that the scientific, technological and industrial community be well informed of the operational and technical problems confronting the Defense Department.

To this end, the Department of the Navy maintains extensive technical information exchange programs to keep the industrial community informed, within the limits of security.

The Navy's Technical Information Program has the broad mission of relating and coordinating industry needs for technical information. The objectives are to:

- Help the Navy create and evolve its research and development plans by stimulating regular communication between the Navy and industry as a part of the research and development planning process.
- Enable industry to plan its self-initiated research and development, based on the best possible official information on present and future military needs.
- Reduce the expense and time of industry of informally gathering data on the Navy's research and development plans, and prevent the waste of national research and development resources caused by errors in data thus collected.

One segment of the technical information program is the Navy Research and Development Information Center (NARDIC). The center was established to supplement the Navy's periodic Advanced Planning Briefings for Industry. NARDIC is a clearinghouse for research and development queries from industry. At a central place, NARDIC makes available research and development planning and requirements documents for on-site examination by industry representatives from large and small business concerns. The reviews are permitted on a controlled and "need to know" basis.

NARDIC maintains a central file of formal Navy classified documents of interest to qualified contractors and potential contractors, *e.g.*, military requirements, threat problems, and planning for various time periods. These documents may contain specific plans for accomplishing research and development, or information which may stimulate such plans. Selected documents are made available for review only to representatives of industrial organizations which have interest and research and development capabilities within the specific subject matter.

In addition, NARDIC refers industry representatives to specific offices, when necessary, for further discussions on detailed technical matters. This practice reduces the number of personal contacts that would otherwise be necessary to keep abreast of Navy research, development, test and evaluation requirements.

Documents Available

Documents currently available for review at NARDIC are General Operational Requirements (GORs), Advanced Development Objectives (ADOs), Tentative Specific Operational Requirements (TSORs), Specific Operational Requirements (SORs), and Exploratory Development Planning Summaries (DD Form 1634).

GORs are forecasts of operational capabilities that will be required in major warfare or support areas to counter predicted threats, and to satisfy anticipated operational objectives projected 10 to 20 years into the future.

The purpose of an ADO is to initiate the process of innovation—the initial application of new technology to a naval warfare system. The primary function of the ADO is to provide information on which to base a decision to pursue the potential development through engineering development toward evaluation for fleet use.

The TSOR function is to identify formally a specific operational need; determine the operational capabilities required to satisfy that need; and request an investigation into the technical feasibility, financial acceptability, and military usefulness of the development.

The SOR establishes a firm requirement for new or improved capabilities and is the final stage in requirements documentation.

Exploratory Development Planning Summaries (DD Form 1634) are used to document planning in exploratory development. They are used at both the project and task area levels.

Using NARDIC Services

The services of NARDIC are available to representatives of industrial, scientific, or other activities that have demonstrated a capability and potential for engaging in research and de-

About the Author—
Lillian L. Morris is Manager of the Navy Research and Development Information Center, in Headquarters, Naval Material Command. Her association with the Department of the Navy began in 1956 and has included assignments in the Bureaus of Ordnance and Naval Weapons, where she was involved in the Technical Information and Public Affairs Programs. In Headquarters, Naval Material Command, she has been associated with RDT&E program management, participated in the establishment of NARDIC in 1969, and has since been its principal operator.

velopment and who:

- Are participating in the Navy/Industry Cooperative Research and Development Program (NICRAD).
- Have provided NARDIC with an appropriate facility security clearance, as well as visit clearance requests for personnel who are to visit NARDIC.
- Have provided acceptable evidence of specific research and development capability (such as DD Form 1630, "Research and Development Capability Index," company brochures, etc.) in being. (In cases where the organization's area of interest exceeds its current capability in being, evidence should be provided of a realistic and feasible intent to adequately expand that capability.)

Because classified information is available to NARDIC visitors, visit clearance must be obtained. At least two weeks before the initial intended visit to NARDIC, address a visit clearance request to:

Headquarters, Naval Material Command
ATTN: Code MAT 0522
Washington, DC 20360

The request should state:

Purpose of Visit: To visit NARDIC
Persons to be contacted: MAT 03P2

The visit clearance request should indicate the firm's DOD cognizant security office and facility clearance. The request must be signed by the organization's security officer. Hand carried requests will not be honored.

Include a copy of the visit clearance request, signed by the organization's security officer, marked for NARDIC (MAT 03P2). If it is known that other offices or persons in Headquarters, Naval Material Command, are to be visited, include signed copies of the request marked for each office.

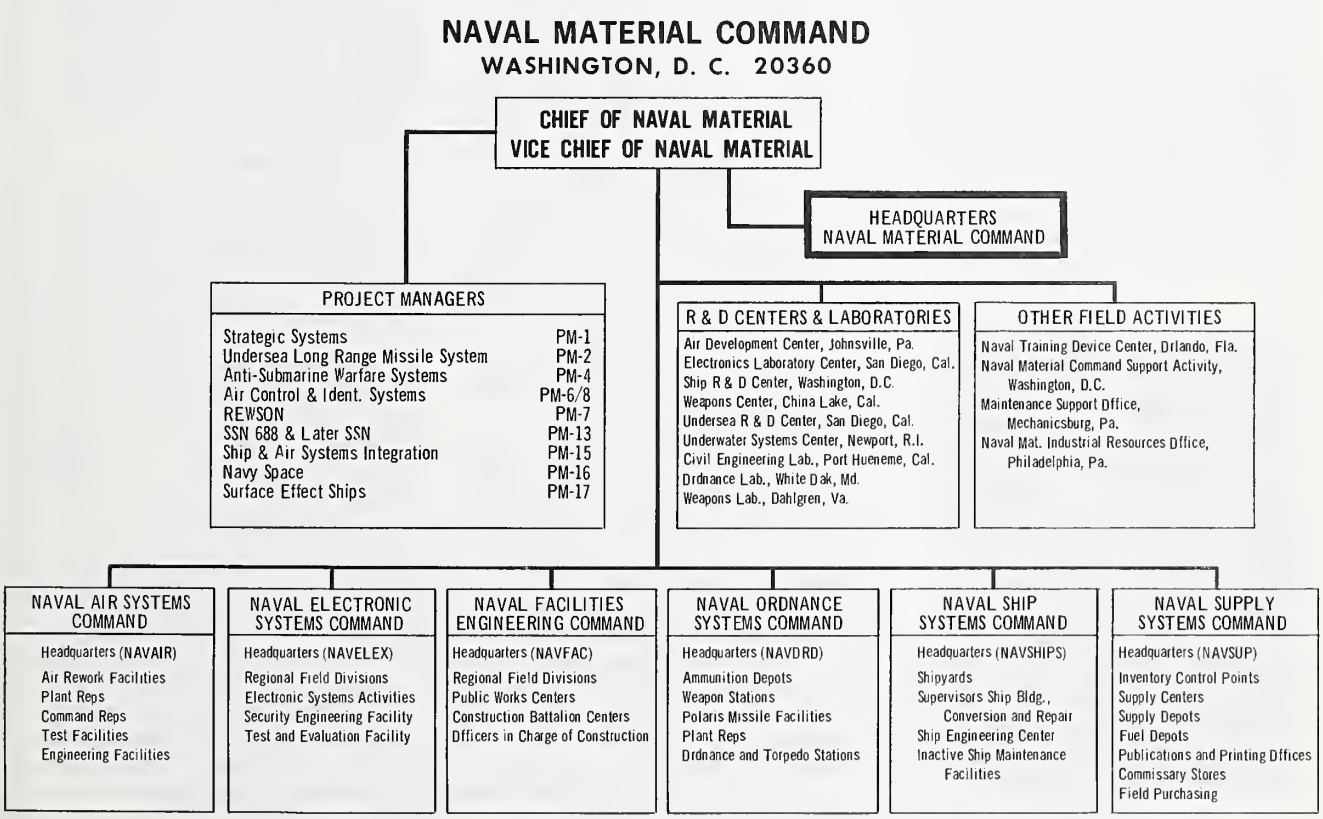
Organizations are encouraged to make visit clearance requests for the one-year period permitted by paragraph 3–201b, DOD Regulation 5220.22–R, "Industrial Security Regulation." To reduce updating and processing effort, firms are also encouraged to anticipate who might be visiting NARDIC and list their names on a single visit clearance request.

Because facilities are limited, subsequent visits to NARDIC must be scheduled. Once visit clearance has been granted, reservations may be requested by calling or writing NARDIC two weeks in advance of the intended visit. Rooms may be reserved from 9 a.m. to 12 noon, 1 p.m. to 4 p.m., or all day, Monday through Friday. Specific areas of interest or specific documents desired may be stated at that time.

The center is part of the Information Branch of the Program Management Office of Headquarters, Naval Material Command. It is physically located in Room 920, Crystal Plaza Building 6, Jefferson Davis Highway (U.S. Route 1), Arlington, Va., telephone: (202) 692–1113 or 692–1114. It is near both the Pentagon and Washington National Airport. Mailing address is:

Headquarters Naval Material Command
Attention: Code 03P2
Washington, DC 20360

Classified notes or magnetic tape recordings, or both, may be made during visits to NARDIC. These will be mailed by NARDIC personnel to the



organization's facility mentioned in the visit clearance request providing that facility has the required safeguarding capability for the security classification of the material involved. Containers for mailing magnetic tapes must be provided by the user. Hand carrying of classified material from the NARDIC will not be permitted.

NICRAD Program

The aforementioned Navy/Industry Cooperative Research and Development Program (NICRAD) was established to provide a means of keeping industry scientists and engineers informed of the Navy's technological capabilities and requirements. Under this program, firms, individuals and other activities with a capacity for engaging in research and development and a reasonable potential for eventually receiving and executing a contract in a specified area of interest are invited to establish specifically designated projects. Such projects are established voluntarily and are not directly supported by Navy contracts.

To participate in the NICRAD, direct contact should first be made with the Navy component concerned with the technical area which best matches the interests, capabilities, and potential of the interested organization. Information should be furnished regarding product line, research and development capabilities, and contracts the company has, or has had, with the Navy or other agencies or offices of the Defense Department.

Upon request, NARDIC personnel will assist interested persons to determine the appropriate Navy bureau, office, or systems command. With the establishment of a specifically designated project, it is intended that there be an exchange of information between the parties involved. If the firm, individual, or other activity has the required degree of security clearance and adequate stowage capability to safeguard classified information, the sponsoring technical office may release relevant classified information.

Since NARDIC began operations in August 1969, there has been a distinct switch in the type of person who has been using the services of the center. During the 18 months of operation, there have been more than 800 visits from planners and engineers representing more than 275 industrial organizations to review up to approximately 1,100 classified planning and requirements documents. First, there were the curious; next, the man with the product that is going to solve the problem; and then the man who is truly the planner—the one who is guiding the future plans and operations of the industrial organization he represents. The recent trend has been for more repeat visits with emphasis on future Navy research, development, test and evaluation requirements to which industry can respond. Such responses are expected to be of mutual benefit, and will improve the effective interchange of Navy technical information with industry.

Army Research and Development Documents Available at TILO

Major Donald E. Gauntner, USA

The accelerating progress of American science and industry is providing the Army with opportunities for enhancing its strength and effectiveness as a fighting force greater than ever known in our history. To assure maximum exploitation of these opportunities, the Army Chief of Research and Development recognizes the importance of a progressive industrial relations program as an integral and vital part of research and development efforts.

It is incumbent upon the Army to provide current advanced planning information and a better and broader understanding of military materiel needs to industry. On the other hand, industry must make its capabilities known to the Army.

At the Department of Army level, the Chief of Research and Development maintains a Technical and Industrial Liaison Office (TILO). This office provides opportunities to industrial planners to review authoritative and current information in official Army planning documents. Army programs, plans and problems are discussed individually and in a definitive manner with industry representatives.

TILO provides this service for those industrial organizations which have established a need-to-know and possess the necessary security clearances. Under these conditions, industry representatives can be provided information on specific requirements of the Army, the efforts needed to satisfy approved requirements, and the projects within the categories of research that are programmed to accomplish those requirements.

Planning Information

At TILO there are several Department of the Army long-range planning documents that provide guidance for research and development projected up to 20 years into the future.

Army Research Plan (ARP), a confidential document, provides an enumeration and appraisal of the research and exploratory development programs responsive to long-range concepts, operational capabilities objectives, and materiel objectives of the Army of the future.

Combat Development Objectives Guide (*CDOG*), a secret document, provides guidance for combat development activities and for the research and development program of the Army. The CDOG is a composite formulation of needs identified by five types of entries that directly concern Army research and development: Operational Capability Objectives, Qualitative Materiel Development Objec-

tives, Advanced Development Objectives, Qualitative Materiel Requirements, and Small Development Requirements.

An Operational Capability Objective (OCO) is an approved description of an operational capability, needed primarily in the long-range time frame (10 to 20 years).

The Qualitative Materiel Development Objective (QMDO) is broad in nature. It is a need that exists for the development of new materiel, but the feasibility of such a development is considered either unknown or in question, and research or exploratory development is necessary.

An Advanced Development Objective (ADO) directs effort aimed at furnishing research and development items for experimental or operational test. Its purpose is to clarify cost, operational, or technological factors prior to commencing engineering developments of items for military use.

The Qualitative Materiel Requirement (QMR) describes a military need for a new item, system, or assemblage for which technical feasibility has been demonstrated. The desirable or essential military characteristics are properly detailed.

The Small Development Requirements (SDR) prescribes a need for small items of equipment or materiel of proven feasibility which can be produced in a relatively short time. These requirements are not as complex as QMRs and are low in cost.

Four of these objectives/requirements documents will be converted to a single "materiel needs" (MN) document in a phased process in the near future. The new MN document will establish the need for new or improved materiel for the Army, and provide guidance to the materiel developer throughout the life cycle of materiel.

The MN is intended to establish closer coordination between the requirements agency and the developer. All MNs will be identified at the concept formulation stage of the life cycle (comparable to the position of the QMDO in the old system) and be revised throughout the life cycle of the materiel item through the joint face-to-face efforts of the combat and materiel developers. Total feasibility will be determined before an item enters the engineering design phase of development. Administrative processing will be shortened, as the existing requirements documents (QMDO, ADO, QMR and SDR) are replaced by one. Processing time should be reduced from 30 months to 30 weeks.

The Army Systems Coordinating Document (*ASCOD*), a new classified document, contains analyses of each of the materiel objective areas. The analyses enhance the planning system for coordinating research and development activities, proceeding from approved objectives through requirements to the ultimate allocation of research development, test and evaluation (RDT&E) resources.

The ASCOD covers the research and development efforts directly associated with the materiel objectives of the Army Strategic Objectives Plan (ASOP). Each identifies the effort needed to satisfy approved requirements, highlighting pacing activities and problem areas.

This new family of documents—an Army "first" on the problem of resource allocation—features the following materiel objectives areas:

- Air and Ballistic Missile Defense.
- Air Defense.
- Air Mobility.
- Electronic Warfare.
- Communications.
- Indirect Fire.
- Infantry.
- Intelligence/STANO.
- Logistical Support.
- Surface Mobility.
- Tactical Command and Control.
- Tactical Nuclear Operations.
- Tank/Anti-Tank.
- Chemical/Biological.

Threat Estimates, relating to each of the materiel objectives of the ASOP, provide succinct information on the tactical and technical threat. This is a companion series to the Army Systems Coordinating Documents.

The Non-Material Objectives Coordinating Document (NMOCOD) identifies research and development effort associated with the non-materiel Objectives of the ASOP in much the same fashion as the ASCOD series addresses materiel objectives.

The Research and Technology Coordinating Document (RTCOD) presents technology needs and problems identified in the ASCOD series, together with similar items from the NMOCOD, and those items of opportunity or high payoff not yet related to specific materiel systems. The RTCOD addresses the Army's research and exploratory development in terms of the support it provides to broad operational needs. The RTCOD will eventually replace the current Army Research Plan.

The Army Research and Development Project List is an across-the-board look at the total Army research and development program within the categories of research and all related activities. This compilation lists the projects that have been established in the Five Year Defense Program. The project list represents all on-going and planned Army RDT&E funded work at the projects and task area levels. It provides a means for evaluating the relevance of RDT&E efforts to approved Army requirements and objectives.

Major Donald E. Gauntner, USA, is a staff member of the Technical and Industrial Liaison Office, Office of the Chief of Research and Development, Department of the Army. Previously, he was with the program management office, Army Advanced Ballistic Missile Defense Agency. He has also been Chief of Aviation Systems Command Liaison Office, Army Airborne Communications and Electronics Board. He holds a bachelor degree in education from Indiana State University of Pennsylvania.

Where Can Documents Be Seen?

TILO has these documents. It is like a library with the shelves lined with Army needs—cross referenced with on-going work, supporting those needs and planned actions for future work.

These documents, or portions of these documents, are available to industry planners on a "need-to-know" basis so that industry can determine what the Army needs and what is being done to fulfill specific requirements.

Certain policies govern release of development information to industry. The following information, contained in development objectives and requirement documents, will not be released:

- Funding information.
- Proprietary information.
- Qualitative figures that indicate project purchases, total quantities, or number to be procured for test and evaluation.

Planning documents can be reviewed daily by qualified industry representatives at the Technical and Industry Liaison Office, Office of the Chief of Research and Development, located in Room 3D380, The Pentagon, Washington, D.C. Companies may schedule a reading room for a half day, or a full day on the first visit. Three briefing rooms enable TILO to accommodate up to six industrial representatives a day.

Companies should make appointments at least two weeks in advance. The aforementioned requirements for qualification and a statement of specific areas of interest must be made in writing to:

Chief of Research and Development
Department of the Army
ATTN: Chief, Technical and Industrial Liaison Office
Washington, DC 20310

At the same time, a visit authorization request must be sent to:

Chief of Research and Development
Department of the Army
ATTN: Security Control Officer
Washington, DC 20310

The two-week lead time for the visit authorization request is needed for mailing and processing. Information to be included in the visit authorization request is shown in Figure 1.

The request for visit may be made to cover a one-year period. This is provided for in DOD Industrial Security Regulation 5220.22-R, paragraph 3–201b. This reference should be noted on the request for visit. The request should be annotated to indicate that the individual representative has been designated by his company as an authorized messenger for transmission of classified material. The request should also be annotated with the phrase, "To visit TILO."

For further information contact the Chief, Technical and Industrial Liaison Office, at address given previously, or by telephone: (202) OXford 5–6496 and OXford 5–6471.

COMPANY LETTERHEAD

Chief of Research and Development
Department of the Army
ATTN: Security Officer
Washington, D.C. 20310

Reference: DOD Industrial Security Regulation 5220.22–R, paragraph 3–201b.

In accordance with reference, approval is requested for the following employees to visit your facility:

Full Name	Clearance, date issued	Date, place of birth
Job title	(Authorized messenger for classified material.)	

Purpose of visit: To visit TILO.

Dates of visit:

Preson to be contacted: (In Army, if known.)

Statement of facility clearance: XYZ Corp. has a (type of clearance) facility clearance granted on (date) by (granting agency).

I certify that clearance information set forth above is correct.

Approval for this visit is assumed, unless information to the contrary is received.

Cognizant security office for the corporation is (name of DCASR or other office).

I. M. Secure
Security Officer

Figure 1.

Managing Configuration Items

George A. Kanzaki
Edward P. Kindinger
Gilbert J. Tallar

Configuration management is a discipline that describes and controls the technical and administrative aspects of the functional and physical characteristics of a configuration item. Configuration items are produced by industry and DOD acting as partners in the process of acquisition of weapon systems, equipment, and other designated items.

Configuration items are an aggregation of hardware or software, or any of its descrete portions, which can vary widely in complexity, size, and type from an aircraft, electronic or ship system, tank, facility, missile, or data program to a test meter or round of ammunition.

Each of these configuration items must satisfy an end use function and be designated by DOD for configuration management.

In designating an item for configuration management, what does DOD desire industry to do? Simply stated, it wants industry to:

- Understand the basic principles of configuration management.
- Become knowledgeable in current procedures for configuration management.
- Prepare data required by applicable military standards and regulations.
- Strive to attain the objectives of configuration management.

This article will discuss each of the aforementioned points in turn to emphasize and summarize pertinent requirements, and to serve as a compendium of the contractor's responsibilities in configuration management during the acquisition of weapon systems and equipment by the Defense Department.

Basic Principle

The basic principle of configuration management is to simplify the weapon system so that it can be understood, analyzed, categorized and, consequently, its development and acquisition effectively managed. This is accomplished by breaking down the complex system to more controllable components and, thus, portraying the total weapon system with the desired visibility and format for an accurate assessment by the project manager at anytime in its life cycle.

This is not a new principle. It was introduced in 1794 during the Administration of John Adams, the second President of the United States. Unfortunately, as the years passed and several "hot" wars demanded rapid production of weapon systems at other than minimum cost, the principles of configuration management were neglected. During recent years, however, as weapon systems became enormously complex with resulting undesirable cost growth, the Office of the Secretary of Defense and the military Chiefs of Staff recognized that all three military services faced common problems in the area of identifying, controlling, and accounting for configuration items.

A concentrated effort was, therefore, made by both industry and the Defense Department to revitalize configuration management. In 1968, DOD Directive 5010.19 established DOD policy governing configuration management, which was implemented later in 1968 by DOD Instruction 5010.21. During the next few months, a group of military standards documents, dealing with configuration management, were published resulting from collaboration with the Industry Advisory Council (IAC) and the Council of Defense and Space Industry Associations (CODSIA).

The provisions of DOD Directive 5010.19 and DOD Instruction 5010.21 were published, in turn, by the Army, Navy and Air Force in Army Regulation 70–37, Air Force Regulation 65–3, and Naval Material (NAVMAT) Instruction 4130.1. Configuration management applied to contracts administered by the military services is governed by these regulatory publications. Applicable military standards documents will be identified as the various aspects of configuration management are discussed in this article.

Baseline Principle

Probably, the most important single concept introduced with configuration management is the baseline principle. A "baseline" evolves from an approved configuration identification document or a set of such documents that have been formally designed and fixed at a specific time during a configuration item's life cycle.

Prior to present-day configuration management, the key ingredient that was lacking was a uniform system—an agreed upon definition of documentation requirements for each phase.

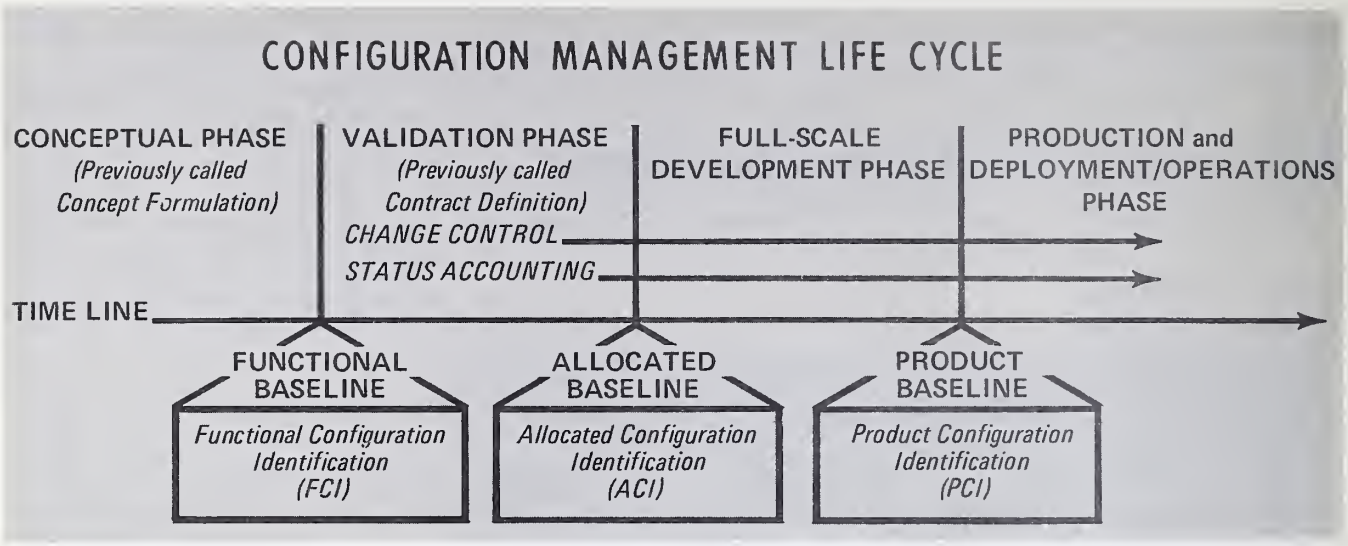


Figure 1.

This key ingredient is now provided by baselines which establish the item identification at that point in the life cycle. There are three baselines (Figure 1):

- The *functional baseline* is established by the currently approved technical documentation/system specification which becomes the functional configuration identification (FCI). This documentation is prepared by the procuring agency during the conceptual phase. It prescribes all functional characteristics and design constraints of the weapon system as an entity. This is the starting point for efforts in the validation phase.
- The *allocated baseline* is established by the development specifications and becomes the allocated configuration identification (ACI). The development specifications are prepared by the contractor during the validation phase. They describe performance characteristics to be achieved by each of the prime configurations items which comprise the weapon system. In these specifications, contractor tests necessary to confirm achievement of the performance requirements are also included. This baseline is the starting point for the full-scale development phase.
- The *product baseline* is established by the production specifications and becomes the product configuration identification (PCI). Product specifications are prepared by the contractor during the full-scale development phase to prescribe all the necessary physical or form, fit, and function characteristics of the configuration items that comprise the weapon system. In these specifications, the functional characteristics that are designated for production acceptance testing are also included. After a functional configuration audit and a physical configuration audit have proven a prototype has met specified performance requirements, product specifications are approved. These audits verify that the developed configuration item will perform as intended and the "as built" configuration of the item matches the product specifications and drawings. The product baseline is the starting point of the production and deployment/operations phase.

These baselines epitomize the four major aspects of configuration management:

- *Identification.* Each baseline is established by specifications which identify the configuration at that specific point in the life cycle. This series of identification documents begins in the conceptual phase by broadly describing the overall functional characteristics of the configuration item, and become more specific as the program progresses. This evolution of configuration identification is shown in Figure 2.
- *Control.* Once the baselines have been established by the government's release of the basic identification documents (specifications) to the data bank, all changes to those documents must be controlled through formalized change procedures.
- *Accounting.* Current knowledge of the basic identification documents, which establish the baselines, is essential for effective management. The manager must also know everything that happens to each control document and the effect of changes on related hardware or software.
- *Audit.* Prior to production, the functional and physical characteristics of the configuration item must be verified to assure performance and adequacy of documentation.

Procedure

The program manager may be designated a configuration manager. If so, he is assigned the responsibility and is delegated the authority for the management of all configuration items. He may operate a configuration management office for larger programs.

On matters relating to a system program, the contractor's contact is generally through the contracting officer representative, a development engineer assigned to the procurement office. The contracting officer representative provides the technical liaison essential for resolving engineering development, operational and maintenance inquiries, and communicates the resolutions to the contractor.

Configuration Management Plan

During the conceptual phase, the configuration manager prepares a configuration management plan for submission with the system development plan. This initial configuration management plan is specifically tailored to be consistent with the nature and complexity of the item involved and the quantity and size, scope, and stage of the life cycle of the procurement effort.

The configuration management plan must clearly define:

- Responsibilities of the program manager and the functional support elements.
- Interfaces among all the affected elements of the program.
- Procedures for recording the established requirement for materiel.
- Procedures for handling proposed changes and ensuring their review for their total life-cycle cost impact.
- Procedures for maintaining an accurate record of the requirements, changes, and hardware status throughout the life cycle of the materiel.

When approved, the configuration management plan serves as authorization to proceed and copies of the plan are provided each competing contractor.

Contractor Procedures

The contractor will usually be given a task to develop a configuration management plan for approval prior to execution. This plan should provide the methods, needed data elements, and procedural documents that are to be used by the contractor's management to maintain, control, and administer the configuration management task under the contract.

Specifications. During the development phase, the contractor is usually required to prepare development and product specifications in the form identified in his contract. Military Specification MIL–S–83490, "Specifications, Types, and Forms," prescribes the general requirements for the preparation of specifications for DOD; and MIL–STD–490, "Specification Practices," establishes the format and content of specifications.

Configuration Control. Standard change criteria and practices for configuration control, or "change control" as it was formerly known, is communicated to industry in the form of MIL–STD–480, "Configuration Control—Engineering Changes, Deviations, and Waivers," and MIL–STD–481, "Configuration Control—Engineering Changes, Deviations, and Waivers (Short Form)." Each proposed change to the configuration identification dictates the need for a systematic and thorough evaluation, as it may impose new or drastically revised obligations upon other activities involved in the acquisition and operational support of the item. DOD policy was recently updated with respect to the criteria for proposing engineering changes. These changes, waivers, or deviations affecting the government's interest shall be limited to those which are necessary

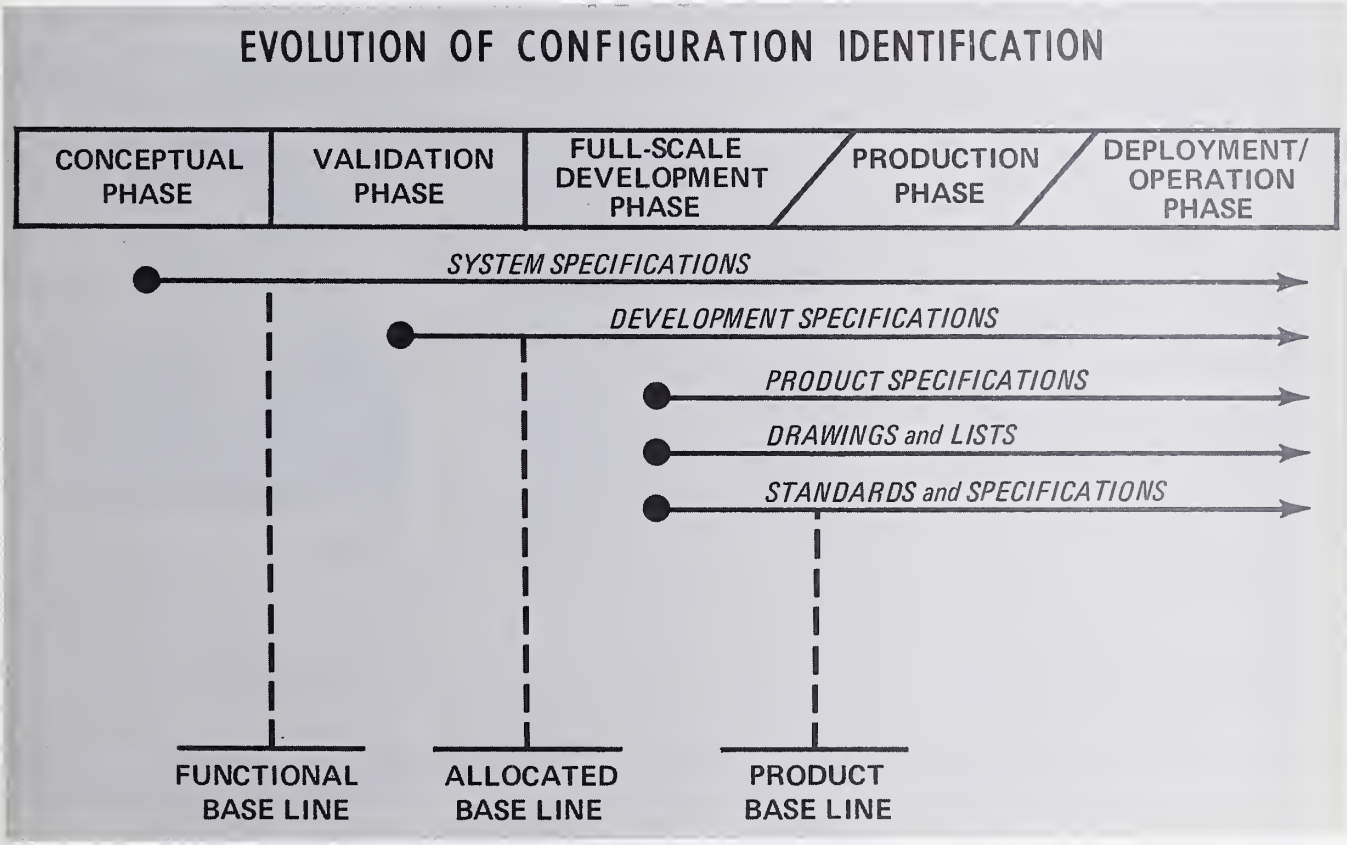


Figure 2.

or offer significant benefit to the government. Necessary or beneficial changes are those which are required to:

- Correct deficiencies.
- Make significant effectiveness change in operational or logistics support requirements.
- Effect substantial life-cycle cost savings.
- Prevent slippage in an approved production schedule.

On major systems, prime contractors should provide the majority of the information that is needed for proper evaluation of an engineering change proposal (ECP), using the ECP checklist form prescribed by MIL–STD–480. A shorter, single-page ECP form is provided for in MIL–STD–481. It is intended for use in contracts involving either multi-application items not peculiar to specific systems, or for procurement from a contractor who cannot reasonably be expected to know all the consequences of the proposed change. Regardless of ECP form, the objective is to provide the framework for systematic, comprehensive evaluations. Emphasis on the control of configuration has helped to limit approval of unnecessary and costly ECPs and the proliferation of unlike configuration items in the opertional field.

Configuration Control Board. The evaluation of each proposed change is usually accomplished by a configuration control board. This board hopefully considers all aspects of the change on the appropriate configuration item and on the other configuration items with which it interfaces. Major emphasis is placed on the total life-cycle cost of the proposed change to contractor and in-house operations. Contractor participation in meetings of the Configuration Control Board is at the option of the configuration manager. He may desire contractor participation whenever prompt and concurrent notification is vital.

Engineering Release. During the production phase, the contractor is required to have an engineering release system to record all specifications and drawings released for manufacture of configuration items. The engineering release system should be capable of determining the contractor's, subcontractor's, vendor's, or supplier's part numbers for any part or assembly, and effectiveness of any changes by configuration item serial numbers.

Status Accounting. The configuration manager is responsible for establishing the status accounting system needed to identify essential configuration item baselines, status of proposed and approved changes, and implementation of approved changes. Only the information necessary to manage the system effectively and economically should be recorded and reported. The configuration manager shall employ automation only when sheer volume of data precludes effective performance of the system and is proved to be economically feasible. In those cases when the contractor has documentation control of drawings, the status accounting is usually performed at the contractor's facility. For this reason, it is essential that the contractor be familiar with MIL–STD–482, "Configuration Status Accounting Data Elements and Related Features." This document describes standard data elements, and their related data items, codes, use identifiers, and data chains. These elements form the content of the configuration status accounting records and reports developed from the configuration management process. The configuration manager must prescribe the data elements and related features, the status accounting record format to be used, and the frequency of the status account reports.

In summary, industry should become familiar with the following DOD configuration management documents:

Specifications and Drawings:

- MIL–S–83490—Specifications, Types and Forms.
- MIL–STD–490—Specification Practices.
- MIL–D–1000—Drawings, Engineering and Associated Lists.
- MIL–STD–100A—Engineering Drawing Practices.
- MIL–STD–130C—Identification Markings of U.S. Military Property.

Configuration Control:

- MIL–STD–480—Configuration Control—Engineering Changes, Deviations, and Waivers.
- MIL–STD–481—Configuration Control—Engineering Changes, De-

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viations, and Waivers (Short Form). *Configuration Status Accounting:*

- MIL–STD–482—Configuration Status Accounting—Data Elements and Related Features.

The documents and implementing regulations of the military services* contain standard terminology which should be adopted and used by industry and DOD.

Objectives

The principles and procedures of configuration management have been discussed in this article principally from the standpoint of the contractor. The question now arises. What should the contractor strive for in his configuration management procedures? If he seeks to help the government achieve its objective, he will:

> **"Assist management in acquiring at the lowest sound cost, the required performance, operational efficiency, logistics support, and readiness of a configuration item."**

To gain this objective, the government allows the maximum degree of design and development latitude, providing the degree and depth of configuration control necessary for effective production and logistic support In other words, during the development of a system, the contractor is given maximum allowable flexibility to use his innovative capability. This will enable him to design a product or system that fulfills the customer's needed performance (functional) requirements at minimum cost and on schedule. The customer then establishes the design through approved baselines so as to minimize needless variation in configuration items and to simplify ensuing operations and support.

Contractors are expected to join DOD in striving to attain a second important objective which is to attain maximum efficiency in the management of engineering changes with respect to their necessity, cost, timing, and implementation. Configuration managers must recognize the continuing need for beneficial change and prevent unnecessary changes. Provisions of MIL–STD–480 establish reasonable target times for processing, priorities for expediting specific important changes, and standard coding assignments for different types of changes.

Contractors are expected to recognize that the primary goal of the customer's documentation is to obtain the optimum degree of uniformity in configuration management policy, data, forms, and reports at all interfaces within DOD, and between DOD and industry with each configuration management system *tailored* to program needs. With this uniform approach, the cost of carrying out configuration management activities is minimized. This approach is far less expensive than haphazard handling of engineering change proposals and associated documentation. In addition, establishing baselines and controlling changes to these baselines counters cost growth, while still deriving benefits of needed changes prior to deployment of weapons systems and equipment.

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** Military standards documents are available from the Naval Publications and Forms Center, 5801 Tabor Ave., Philadelphia, PA 19120. Military service regulations may be obtained through the cognizant military service procuring agency.*

Auditor and Performance Measurement

(*Continued from page 17*)

lated data in the prime contractor's monthly report. The purpose of this review is to ensure that subcontract values (actual costs, earned values, and forecasts to complete) are incorporated in the prime contractor's report with a minimum of delay.

Summary

It is rather difficult to synopsize all the ramifications and aspects of performance measurement as it relates to the responsibilities of the auditor. Certainly the criteria of cost/schedule control has to be interrelated to other facets of a contractor's operations with which the auditor is concerned on a continuing basis. In fact, the auditor attempts to integrate his performance measurement activities with reviews of incurred and proposed costs on other contracts performed in the same cost centers. Considerable data developed in reviews of these latter areas can aid immeasurably in both the validation process and in continuing surveillance activities. Conversely, reciprocal benefits are derived from participation in performance measurement activities.

At the present time, there are about 25 contractor performance measurement systems which have been validated. Several more are scheduled for demonstration/validation reviews in the near future. Although this number is minimal when compared to the number of defense contractors involved, the dollar amounts are large and industry involvement with performance measurement is expected to have considerable growth. Assistant Secretary of Defense (Comptroller) Robert Moot recently stated that all major defense contractors will eventually have a performance measurement requirement, if not as a prime contractor then as a subcontractor in a major weapon system program. The DCAA audit activity in contractor performance measurement will expand in consonance with its application to defense system acquisition.

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